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MOTOR AGE

Now for the National Show

CHICAGO, Feb. 1—Eighth under the auspices of the National Association of Automobile Manufacturers and the ninth in Chicago, the annual show organized by Samuel A. Miles, ably assisted by L. L. Fest, will open its doors next Saturday afternoon for a week's run. Every space has been sold and as always is the case in Chicago there is a long waiting list made up of tradesmen who are hoping against hope that someone will flunk between now and next Saturday and give some of the unfortunates a chance to get a bit of that valuable space. But there are few who have been forced to scratch their entries and the indications point to a more beautiful, more thoroughly national show than ever has been given in the western metropolis.

Space at a Premium

It may not be as big a show as some of its predecessors, there being in the neighborhood of 260 names on the list, but this does not detract from its importance. The show is smaller in point of numbers because of the fact the Seventh Regiment armory is not being used this year. This naturally cuts off many square feet of valuable floor space. As a matter of fact there are more exhibitors in the Coliseum and First Regiment armory than in the preceding show. Miles has effected this by cutting down the spaces assigned some of the accessories people. The car makers have not suffered any.. As Mr. Miles expresses it, it would be possible to fill a building twice as large as the present Coliseum.

"It always has been my regret," said Manager Miles, "that the original Coliseum, which was out on Sixty-third street, was destroyed by fire. That place was ideal; it was big enough to put a quarter-mile bicycle track inside of it and then leave room for the spectators on the outside. If we had that we could comfortably house the pleasure cars, but I am afraid we would be pinched for space when it came to placing the commercial exhibits."

The Coliseum and First Regiment armory will again be used for show purposes. The Seventh Regiment armory was used at the last show for the commercial cars, but that proved a failure because it was nearly three blocks from the Coliseum. This year Miles decided to put the business rigs elsewhere, so he has parked them in the basement of the Coliseum. They are few in number this year.

Main Exhibit in Coliseum

As diagrammed for this show, the principal exhibit will be on the main floor of the Coliseum, where most of the leading car-manufacturing concerns have been placed. In the gallery will be the accessories, as usual, while in the basement will be the commercial exhibits and some of the motor buggies. The motor cycles have been placed on the second floor of the Coliseum annex, where also will be located more of the makers of accessories. On the main floor

of the armory will be more cars, while the gallery in the citadel will be utilized for the overflow of the sundry people.

The formal opening of the show will take place at 2 o'clock Saturday afternoon, and the closing hour has been set for 10:30 o'clock. The public will not be admitted on Sunday, but on the mornings thereafter the doors will be opened at 10 a. m. Between that hour and noon any motor car agent who represents an exhibitor will be admitted by way of the main entrance to the armory without charge, providing the proper credentials are furnished.

Mercury Will Be There

Manager Miles has spread himself on the decorations this year and even now, when the two buildings are in the hands of the workmen, it is possible to see that the scheme is going to work out to great advantage. As before, papier mache will make up the bulk of the decorating material, although there will be some stucco used. Mercury refuses to be lost and he will be there; but he will be a refined Mercury this time, looking down upon the thousands from the center of a stained glass window effect which is particularly striking. There will be more than one Mercury—he will be everywhere, it would seem.

The same general scheme of arches has been retained, but of course they represent different scenes. Potted plants on the top of the huge arch back of each booth will add to the attractiveness of the scene. The color scheme is bronze, and it is easily anticipated that the result will prove most pleasing to the eye.

Public Eager for Show

This will be the first show in Chicago since December, 1907, and of course the city, or the motoring section of it, is eagerly awaiting the opening of the doors to see what American makers have to offer at the one national show. A. L. A. M. and A. M. C. M. A. will be well represented and in addition there will be twenty-six makes of cars that have not been seen at either the palace or the garden. Four of these are among the giants of the industry—Rambler, Oldsmobile, American Locomotive and Buick—which should add to the attractiveness of the menu. Among the other pleasure cars are the French Berliet, Dorris, Auburn, Cameron, Glide, Meteor, Great Western, Pittsburg Six, Rider-Lewis, Ricketts, Richmond, Owen Thomas, Halladay, and Emancipator. Some of them are motor buggies, the Bendix, Clark-Hatfield, Duer, Mier, Staver and Zimmerman. The Bendix also will have a low-wheel pleasure car, while the American Locomotive will show a commercial proposition, its taxicab. The Randolph truck is a new one. The Columbus electric was not shown in New York.

Some Not in Last Show

When one looks over the exhibitors' list it is discovered that there are at least thirty car manufacturers represented who were not in the December show of 1907. On this list are the E-M-F, Matheson, Midland, Pennsylvania, Ricketts, Mishawaka Simplex, York Pullman, Detroit electric, Anderson motor buggy, Dorris, Fiat, Pittsburg Six, Kiblinger, Meteor, Great Western, Mora, Overland, Rauch & Lang, Speedwell, Bendix, Cameron, Clark-Hatfield, Emancipator, Grabowsky, Inter-State, Mier, Randolph, Rider-Lewis, Owen Thomas and Zimmerman. Some of these are veterans in the trade and simply skipped the last show, among them being the Dorris and Rauch & Lang electric. Others are new and come to the national mart for the first time, among these being the E-M-F, Midland Ricketts, Detroit electric, Anderson, Pittsburg Six, Kiblinger, Meteor, Great Western, Speedwell, Inter-State, Emancipator, Clark-Hatfield, Randolph, Rider-Lewis, Owen Thomas and Zimmerman.

Old Friends Missing

Also one discovers that there are thirty-two car makers who were in the previous show and who are not answering roll call this time, those listed being the Aerocar, Autocar, Bugmobile, Byrider electric, Cleveland, Colt, C. V. I., Diamond T, Dragon, Columbia, Gearless, Imperial, Lauth-Juergens, Frayer-Miller, Lorraine, Mason, Monarch, Northern, Pierce-Racine, Chicago Pullman, Pungs-Finch, Royal, Great Smith, Tincher, Waltham, Wayne and the products of the Aurora Motor Works, Popular Price Auto Co. and the Rockford Auto and Engineering Co.

There will be two makes of foreign cars exhib-

iting, whereas in the previous show the machines of European construction were not given space. This time, however, Manager Miles has managed to make room for the Fiat and the Berliet, the former being exhibited by the Fiat Automobile Co. of New York and the latter by the Berliet Import Co. of Chicago. Both these makes are on the main floor of the armory and the Berliet exhibit was shipped here directly from France.

Of course at this time it is impossible to learn how many complete cars and chassis will be shown, but it is believed that Chicago will not be so very far behind London and Paris in the final roundup. In the fall show in 1907 Chicago had 410 vehicles on exhibition, which included pleasure rigs, chassis, electrics and commercial wagons. This was a big increase over the spring show of that year when the number was 359, seven fewer than in the exhibition of 1906.

After the Foreign Markets

The mark the N. A. A. M. has to shoot at is the 1908 French show which attracted 573 vehicles of all sorts last December. This total is much smaller than in 1907 when 694 rigs were shown and in 1906 when 665 were on view. As next best to Paris there is the record of Olympia which had 525 vehicles in 1908, 560 in 1907 and 576 in 1906.

In marked contrast to the commercial exhibit, the motor cycle contingent will be particularly prominent, just as it was at New York, where it was the cynosure of all eyes. Twenty-one makers of the two-wheelers have taken space and been assigned to the second floor of the annex where it is expected they will make a brave display. Those who were at the last show will remember that the motor cycles were about lost through being scattered among the sundries, but this time they will present a solid front.

It is to be regretted that as much cannot be said for the commercial end of the industry. A survey of the list is most disappointing, for apparently the makers of the business rigs have concluded to pass up Chicago. There are few booked, so few, indeed, that Manager Miles hardly thought it worth while to attempt any segregation, so he has placed them in the Coliseum basement among the motor buggies. Evidently the experience in the Seventh Regiment armory has caused this branch of the industry to regard Chicago as "bad medicine."

Those of the car makers who either could not secure space or did not care to exhibit will not permit the occasion to pass without contributing their share to the occasion. In honor of the event there has been a general furbishing of the stores on the row and that famous thoroughfare will be in its gala attire. At least three concerns that are just moving on to the row will be in their new establishments, the Motor Car Supply Co. having a handsome structure built expressly for it a few doors south of its old location. The Levy & Hipple Motor Co., agent for the Chalmers-Detroit, Lozier and Autocar, has deserted Wabash avenue and is installed in its new quarters, while the Speedwell Motor Co., a newcomer, will just about get into its quarters at Michigan avenue and Fourteenth street, where T. F. Smith, formerly the Maxwell representative, will hold forth. The Oakland and Acme are among the other new ones just joining the local colony.

In the way of private shows Palmer & Singer have secured the reading room of the Auditorium where will be displayed five models of its line. It is said that the Columbia also will be in one of the big hotels, through not being able to get in the show. The Royal is another which could not get space and in consequence of this has determined to display its goods in its branch at 1253 Michigan avenue. The Ford Motor Co., which has refrained from exhibiting at Chicago for two shows now, will make a private display in its branch at 1444 Michigan.

Booked for display in the show are several cars that have helped make motoring history in the past year. The Locomobile that won the Vanderbilt will be here, as well as the Vanderbilt and Founders' Week cups. The Thomas people will show the car that won the New-York-Paris race, while the Fiat that captured the American grand prix at Savannah will be here. The Premier hundred-century car is to be on hand after having made a cross country trip from New York with Ray McNamara at the wheel.

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MOTOR AGE

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The Great Westland Motoring Field

SPACE is the great antagonist of the motor car; in fact, space is the great combatant against which all methods of locomotion are directed, and it is but natural that the immediate zone of combat would center within striking distance of those regions where distances are greatest and where the needs of most approved methods of locomotion are greatest. It has always been an inviolable law of evolution that industries originate in centers of greatest population, but soon spread to those localities where needs are greatest. In motoring the central and eastern states were the pioneers and these states have proven so far to be the great buyers of cars; but within the last 12 months an unthought of market has developed in the vast westland and southwestland.

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EVERY effect has a cause and reason for this demand can only be found in the fact that the motor car is a good investment for the people of those districts. In many of these west-central and western states distances between towns are too great to allow of the continuation of horse locomotion to advantage. Business enterprises have discovered a great loss due to consumption of time in covering great distances by horse-drawn vehicles where railroads fail to give adequate service. In the mining districts of Nevada, Utah, Colorado, and other states, the motor car has been in operation for several years, having superceded on many of the big stage routes the picturesque western horse-drawn stage. In fact, in not a few Nevada districts the existence of the silver mines depends entirely upon the use of the motor car, it being impossible to construct railroads to some of the mining districts, or, if it were possible, the expense of construction would not be warranted because of the uncertainty of the mining prospects. In these localities it would be impossible to maintain daily communication with population centers along the great trunk railway lines without the motor car, both because of the distance to be covered and the great difficulty with maintaining any degree of regularity with animal-drawn conveyances.

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SO acute has become the transportation problem of the west that some of the big railroad lines have found it imperative to adopt the motor car for railroading work, having changed it and mounted the gasoline motor in what might be described as a largely over-grown street car, or in more recent years a semi-Pullman car. In places the population is so sparse that it would prove unprofitable to railroads to run regular passenger trains oftener than once a day, which would not be adequate service for large individual or corporate interests in population centers along the route. To these places the gasoline railroad car has proven the salvation, in that it offers transportation every few hours and a service which is faster than that offered by the limited trains and equally comfortable in every respect. It is not unreasonable to claim that these many gasoline railroad cars flitting through the great westland have instilled in many of the inhabitants of these lands the conception of individual locomotion, which proved an admirable introduction to the purchaser of a motor car. So great has been the spread of the motor idea in these territories that it can be said with certainty that the sound of the motor is heard throughout the land, and that no longer are the New England territories, the east-middle areas, and the central-west states under the domain of the hydro-carbon motor, but its sway extends to the foothills of the Rockies and beyond, and has now met that big western motoring field which started in California some years ago and has been progressing in leaps and bounds ever since.

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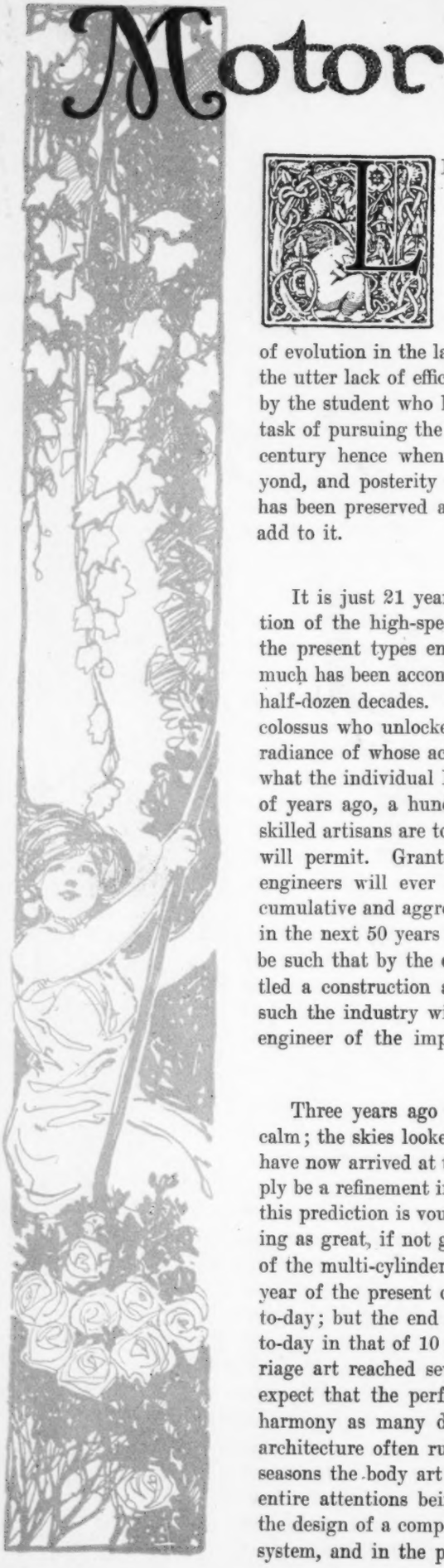
FOR this vast westland the natural distributing point is Chicago. Chicago is the natural and logical distributing point for two reasons: First, it is more closely connected with seven-eighths of the motor factories than any other city of its, or approaching, magnitude of the country, and second, it is more advantageously located from a railroad and shipping point of view than other centers in the country that can possibly aspire to a national distributing point. Within a night's ride of Chicago, which embraces a radius of 600 miles, are such cities as Buffalo, Pittsburg, Indianapolis, Dayton, Cincinnati, St. Louis, Omaha, St. Paul, Milwaukee, Minneapolis, Toledo, Detroit, Elyria, and a dozen other centers which could be named, in which manufacturing interests are located. All factories in these places can to greater advantage locate their big distributing centers in Chicago than at other points. From Chicago to New York by the route of the motor car is but 1,006 miles, a distance which has been conquered in a little more than 2 days; but from Chicago to the Pacific shore line is 2,694 miles, more than two and one-half times the distance to the Atlantic, a fact which but shows the magnitude of western possibilities, many of which have been eagerly grasped by scores of eastern makers.

The "Melting Pot" as Applied to Chicago's Motor Car Show

Motoring Trends



LIKELY Darwin's theory of evolution may be needed in the next three decades, in order to trace the trend of motor car development from the early day when Daimler and de Dion in Europe and Duryea and Haynes of America fanned the early symptoms of car invention into a reality, so great has been the change in trend since now and then. The different stages in the process of evolution in the last 15 years, since the Times-Herald Chicago race proved the utter lack of efficiency of the motor car of that time, are readily conceived by the student who has followed every in and out of the development, but the task of pursuing the thread of change will be immeasurably greater half a century hence when the pioneers have taken their places in the Great Beyond, and posterity will have to decipher their achievements and shortcomhas been preserved at that time of their early cars and what tradition will add to it.

Evolution of the Motor Car in 15 Years

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It is just 21 years ago that Gottlieb Daimler was wrestling with the solution of the high-speed hydro-carbon motor, which was the forerunner of all the present types employed in the cars of to-day; and, if in two decades so much has been accomplished, how much more may be expected within the next half-dozen decades. True it is that Daimler will be recorded in history as that colossus who unlocked the secrets of the internal combustion engine, and the radiance of whose achievements will cover centuries; but it is also a fact, that what the individual Daimler accomplished single-handed but little over a score of years ago, a hundred-score of qualified engineers, technical students, and skilled artisans are to-day bringing to completion as fast as human intelligence will permit. Granted that not a single one of the present multitude of engineers will ever be resplendent with the fame of a Daimler, yet their cumulative and aggregate achievements can be nothing short of mammoth, and in the next 50 years it is safe to assert the improvement in the motor car will be such that by the end of that time or before it will be looked upon as as settled a construction as is the bicycle of to-day. Before the attainment of such the industry will have experienced a few siesmic shocks, to remind the engineer of the importance of progress.

To Daimler Belongs Many Honors

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Three years ago the motoring barometer gave indications of a continued calm; the skies looked clear, the dawn was propitious, and everyone said, "We have now arrived at the ideal car, and in the next few years the work will simply be a refinement in detail of what we have obtained." How far we are from this prediction is vouched for by the fact that each succeeding season is bringing as great, if not greater, radicalisms than those of the past. The adoption of the multi-cylinder engine, while undoubtedly the big factor in the opening year of the present century, was no greater than are many of the changes of to-day; but the end is not yet. It will be hard to recognize the town car of to-day in that of 10 years hence, and that stage of completion, which the carriage art reached several years ago, is not at hand. It would be useless to expect that the perfected motor car body would constitute such a lack of harmony as many do to-day, when in front of the front seat one style of architecture often rules, and back of it another reigns supreme. For several seasons the body art has been a largely neglected one by many makers, their entire attentions being engrossed in the refinement of an efficient motor, in the design of a competent clutch, in the working up of a suitable transmission system, and in the perfecting of a reliable running gear. But the turning of

What Will the Trend Be 10 Years From Now?

the ways is close at hand, and the comfort and luxury of body construction will soon come to its own, and receive that attention which it deserves. It is not to be expected that buyers will be content to receive that continuous jolting, which the tonneau affords on reasonable high speeds when the road surfaces are slightly irregular. In fact, if engineers are competent to produce high-speed, powerful, light-weight motors capable of propelling machines as high as 75 miles an hour, which they are, then these engineers are also capable of bringing the spring suspension, running gear design, and body construction to that state of perfection when hand racks, or foot braces to assist the tonneau passenger keeping in the seat will not be necessary.

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Before dismissing the subject of what can be accomplished in body design, it will be wise to look more after the comfort of the passengers, which has not received as much attention as it should have, and for which oversight the makers can be pardoned, in that their first aim was the achievement of reliability in locomotion, after which comfort comes as a natural corollary. A simple phase of comfort is the heating of cars for winter use. For temperatures as low as freezing, the open body, or the body protected by a folding top with its usual array of storm paraphernalia serves fairly well; but beyond this greater protection is afforded with the limousine, the landaulet, and the town car, to which might be added the taxicab. In many of the higher-priced machines the enclosed car is becoming a work of luxury, in which the art of the carriage builder has not only been reached but in many cases eclipsed, but the maker must bear in mind that conditions in the enclosed motor car are much different than those in the carriage. The speed is higher, the distance many times greater, and so additional comforts are needed.

In Tonneau Passengers Demand More Comfort

At present little arrangements for heating in the winter have been made, although the heating of an enclosed car should prove one of the easiest features of its design, in that the motor car is essentially a heat creation in that high temperatures are essential. But few makers have attempted to utilize this heat to the comfort of the tonneau passengers. In cold weather the taxicab user often shivers with cold during the trip; the user of the landaulet has to resort to robes and other means of comfort; and it often happens that the limousine passengers would welcome higher temperatures. So far few inventions have been brought out on the heating of cars, and it does seem absurd that, with all the heat of the muffler going to waste and the passengers often chilled to the bone, the comfort phase of the motor car is still far from perfection. For open cars the heater could be used to the greatest advantage without a cent of cost for operation other than the installing of a suitable scheme for tapping the exhaust and conducting a part of all of it to a heating system in the floor of the tonneau.

Heating Enclosed Cars One of the Refinements

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It is impossible to state just what the trends in body design will be, but it is at least fair to assume that history will repeat itself, as it is done in nearly every phase of a new system of locomotion. Granted that such will take place, the time is not far distant when body economy will be studied more than at present, and when, for the sake of the passengers at least, the body will be more evenly suspended between the axles than it is many cases at the present time. Within the last few years the forward part of the car has been improved upon in this respect, and the old custom of having the radiator anywhere from 6 inches to a foot in front of the axle is practically obsolete; in fact, not 8 per cent of the cars at the different shows this year are so constructed, although a year ago the percentage was five times this. The maker has realized the importance, from a standpoint of car control, appearance, and other ways, of locating the radiator either directly above the axle or to the rear of it. Mercedes was the pioneer in this respect, and it is surprising to know how quick many European and American makers were to imitate several Mercedes constructions but how slow they were to adopt this valuable one.

Body Economy Will Be Studied in Future

What has happened, and is happening with relation to the radiator and axle at the forward end of the car, is bound to come with regard to the rear axle and tonneau at the rear. Already one or two makers in America have studied body economy with relation to commensurate wheelbase so that the back axle is in the same vertical plane as the rear of the tonneau. A few European cars have used this construction for a couple of seasons, and, in fact, on some of the heavy closed types the axle is in the rear of the line of the back seat. The great advantages of this are apparent from the comfort in riding viewpoint. The advantages also will be apparent in the tire economy, the ease of car control, and the general reduction of wear and tear that years of experience along this line will surely show.

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In body design it was but natural that manufacturers would go to the extreme in the early days, some of them thinking that the tonneau of the car should be almost equal in size to the smoking room of a Pullman car. Little attention was paid as to how this was achieved, and in several constructions it looked as though the body were tetering on the back axle, with as much of the seating part of the car in rear of the axle as in front of it. To-day the majority of limousines are offenders in this respect, actual measurements showing not a few constructed so that the front edge of the seat is in the rear of the axle plane. This construction allows of a short wheelbase, to be sure, which is much sought after in cars for city use, but the price at which such is obtained is high. Many of the limousine compartments, like the early tonneau cars, are abnormally large, and the motor car body architect sooner or later will come to the conclusion that, when a five or seven-passenger compartment is needed it calls for a different style of car. The carriage builder has seen fit to multiply body lines using the hansom, the coupe, the private cab, the Victoria, the brougham, the depot wagon and other types, the line of division being determined by the passenger-carrying capacity and the service to which the vehicle is intended. A multiplication of styles of motor car bodies will come, and soon the body designer will not feel compelled to design a limousine for the owner wanting a two-passenger enclosed car, as well as for the owner requiring a five or seven-passenger enclosed type or a transport company.

Limousine Bodies Generally Abnormally Large

With this multiplication of body styles, it is natural that the comfort of the passengers can be looked after to a marked degree, and this design will make it possible to use short wheelbases well suited for cars intended solely for city work, where street space is limited. It is to be expected that for a decade or two, at least, rough streets in cities and suburban localities will exist, and the smaller body construction will allow of a better suspension of the body with reference to the axles, the result of which will be to greatly improve the riding qualities.

Short Wheelbase For Use in City Traffic

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In the early days—a few years ago—when makers first were possessed with the craze to build commercial cars, all of them who ventured on this expedition, with a single exception or two, thought the sum total of their efforts consisted in fitting solid tires, changing the gear ratio, and substituting a truck body for the passenger one to a pleasure car chassis. Many makers who did this continued the manufacture of these vehicles for but a season; others scarcely devoted more energy to it than the bringing out of the first model. This was enough to show them the error of their ways. Following the early experience of commercializing a pleasure wagon, came the dawn of commercial construction, in which the maker set out to build a commercial car, with an engine suited for commercial purposes, with a transmission system designed to meet the enormous exigencies of the field, and with the running gear commensurate to the demands. This course will be followed by manufacturers in the taxicab and town car line, who will discover that building a taxicab is slightly different from that of a touring car. Granted that the design of a taxicab, fashioned after that of a touring car, would meet every demand from

Mistakes Made in Building Commercial Rigs

a constructive point of view, it would prove in many cases impossible from an operating standpoint. The taxicab is a commercial proposition, and the buyer is as much concerned in its economy of operation and reliability as the pleasure-car maker is in the speed or body color of his car. It is possible to build a taxicab ideal from a constructive viewpoint, but impractical to operate because of the expense. The manufacturer must not overlook the fact that taxicabs are only operated because of the money they make; whereas, limousines, landaulets and big touring cars are often luxuries.

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Lightness One of the Big Factors in Designing

Lightness combined with sufficient strength is the aim of many makers at the present time, and will be an important consideration with not a few engineers in the future types which they will bring out. Previous to the motor car and the bicycle, light weight was never a great factor in locomotion. The designer of the greyhound turbine, which has decimated the days of an ocean voyage as compared with that of the sailing vessel, has little thought for conservation of weight, and if a certain material has not the required tensile strength, he has but to increase the size of a part to satisfy his want. The railroad engineer, in working out the plans for the high-speed locomotive for the 18-hour train, must have weight in order to have tractive force, so that the development of this engine has not compelled careful research work in the production of steels which combine enormous tensile strength and light weight. With a motor car, reduction in weight is essential. The heavy car wears out tires and racks itself over the variable road surfaces, as well as consumes gasoline and oil in propelling it. The enormous strides in the production of high-strength metals has made it possible to cut off as much as 600 pounds of the weight of a car in the last 6 years, and, in fact, this figure has been greatly exceeded on many cars, both because of improvement in design as well as the use of better steels and other metals.

Wants Lightness Combined with Strength

So great has been the evolution of the steel industry, as well as that of aluminum and bearing metals, that the buyer no longer stops to question the strength of an axle or other part which appears much more fragile than those of a few years ago. The days are over when the heavy car maker can use this as a strong talking point, and it is a pleasure to note how, within the last year, makers have been busy in cutting pounds of weight out of the car chassis and body, at the same time not diminishing the strength but often increasing it. This is proving a wise act on every hand, and will do much to reduce the criticism on tires. Not a few owners of cars were compelled to dispose of their big machines because of the cost of tire upkeep, and it is safe to assume that thousands of prospective buyers have postponed the purchase of their cars for a season, or perhaps more, because of the expenditure necessary to maintain an adequate tire equipment. The weight reduction, coupled with reduction in the price of tires, is doing much at the present time to push the stupendous sales of 1909.

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Faulty Steering Design Damages Tires

Tire upkeep has not all been due to car weight or to imperfected processes of manufacture a few years ago; but faulty steering gear design has had a lot to do with the unnecessarily quick wear on front tires at least. It is a fact that many of the manufacturers have worked out their own steering connection system, by which is meant the relationship of the steering knuckle arms with reference to the turning radius of the wheels without respect whatever to the fundamentals of the Ackermann or other systems of steering gear principles. It is also a fact that several makers have from year to year lengthened the wheelbase from 2 to 4 or 5 inches—in some cases 10 inches—and often without having altered the steering construction in the slightest. Careless manufacture of this nature has had a great deal to do with the abnormally quick wear of front wheel tires, and it would be a congratulatory act on the part of tire makers if they in many cases investigated the steering constructions of the cars of certain makers before arranging for the season's equipment of tires.

EXHIBITORS

Motor Cars

COLISEUM—MAIN FLOOR

American Locomotive Co.....New York
Apperson Bros. Auto Co....Kokomo, Ind.
Austin Automobile Co.....
.....Grand Rapids, Mich.
Babcock Electric Carriage Co.....Buffalo
Baker Motor Vehicle Co....Cleveland, O.
Bartholomew Co.....Peoria, Ill.
Buick Motor Co.....Flint, Mich.
Cadillac Motor Car Co.....Detroit
Chalmers-Detroit Motor Co.....Detroit
Corbin Motor Vehicle Corporation.....
.....New Britain, Conn.
Dayton Motor Car Co.....Dayton, O.
De Luxe Motor Car Co.....Detroit
Elmore Mfg. Co.....Clyde, O.
Everitt-Metzger-Flanders Co.....Detroit
Franklin, H. H. Mfg. Co...Syracuse, N. Y.
Haynes Automobile Co.....Kokomo, Ind.
Holsman Automobile Co.....Chicago
Jeffery, Thomas B. & Co..Kenosha, Wis.
Knox Automobile Co....Springfield, Mass.
Locomobile Co. of America.....
.....Bridgeport, Conn.
Lozier Motor Co.....New York
Matheson Motor Car Co.....
.....Wilkes-Barre, Pa.
Maxwell-Briscoe Motor Co.....
.....Tarrytown, N. Y.
Midland Motor Co.....Moline, Ill.
Mitchell Motor Car Co.....Racine, Wis.
National Motor Vehicle Co...Indianapolis
Oakland Motor Car Co....Pontiac, Mich.
Olds Motor Works.....Lansing, Mich.
Packard Motor Car Co.....Detroit
Peerless Motor Car Co.....Cleveland, O.
Pennsylvania Auto-Motor Co.....
.....Bryn Mawr, Pa.
Pierce-Arrow Motor Co.....Buffalo
Pope Mfg. Co.....Hartford, Conn.
Premier Motor Mfg. Co.....Indianapolis
Reo Motor Car Co.....Lansing, Mich.
Ricketts Auto Works....South Bend, Ind.
Simplex Motor Car Co....Mishawaka, Ind.
Stearns, F. B. Co.....Cleveland, O.
Stevens-Duryea Co..Chicopee Falls, Mass.
Studebaker Automobile Co.....
.....South Bend, Ind.
Thomas, E. R. Motor Co.....Buffalo
Toledo Motor Co.....Hartford, Conn.
Welch Motor Car Co.....Pontiac, Mich.
White Co.....Cleveland
Winton Motor Carriage Co.....Cleveland
Woods Motor Vehicle Co.....Chicago
York Motor Car Co.....York, Pa.

FIRST REGIMENT ARMORY—MAIN FLOOR

Anderson Carriage Co.....Detroit
Anderson Carriage Mfg. Co.....
.....Anderson, Ind.
Atlas Motor Car Co.....Springfield, Mass.
Auburn Automobile Co.....Auburn, Ind.
Berliet Import Co.....Chicago
Black Mfg. Co.....Chicago
Brush Runabout Co.....Detroit
Buckeye Mfg. Co.....Anderson, Ind.
Cartercar Co.....Pontiac, Mich.
Chicago Coach & Carriage Co....Chicago
Columbus Buggy Co.....Columbus, O.
Dorris Motor Car Co.....St. Louis
Fiat Automobile Co.....New York
Ft. Pitt Motor Mfg. Co.....
.....New Kensington, Pa.
Gaeth Automobile Co.....Cleveland

History Made by Chicago Show

Manager Miles Tells of Early Struggles "More Space" Cry of Many Each Year

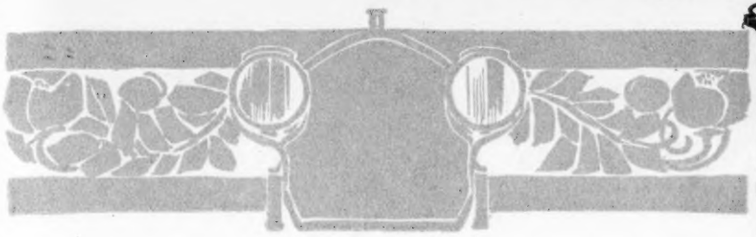
THIS will be the ninth show that has been held in the Coliseum building in Chicago, but only the eighth which has been run under the auspices of the National Association of Automobile Manufacturers, so eighth it is on the advertising literature. The first one of the shows was run in 1900 and the N. A. A. M. had nothing to do with it. It was a personal affair and when the Chicago Automobile Club was asked to assist in the promotion of it, it declined to participate, believing that there was little chance for success. But the show was held just the same and while the management did not reap any golden harvest its object was accomplished, it succeeding in stirring up great enthusiasm in motoring and every exhibitor was well repaid for his efforts. In fact, so much business was done in securing representation throughout the country that every one of the exhibitors in 1900 applied for space in the show of 1901. It is remembered in connection with the first show that it was necessary to build an exhibition track 18 feet in width.

Well established the first year, the promotion of the second show was an easy one. The National Association of Automobile Manufacturers appeared on the scene. The N. A. A. M. then was a weakling, its policy unsettled and some of its members averse to two big shows. It was even considered to either hold one show in New York alone or alternate between Gotham and Chicago every other year.

In this second affair the available space was increased by using the Coliseum annex and instead of the track two huge machines were erected on which the cars could be driven, a dial showing the distance each traveled.

More space was demanded for the third show and the management squeezed out a little extra. Again the show was a success. The next year the cry for room still continued and the second floor of the annex was pressed into service. The fifth year rolled around and the management felt the pressure even more, so the seating space in the gallery was boarded over and in addition the First Regiment armory secured. Even with all this new floor space every one was not satisfied. The management then thought it had reached its limit and stood pat for the sixth show, but when the seventh came to hand the exhibitors were not to be denied, so the managerial brains once more got busy, the result being the securing of the entire Seventh Regiment armory, which was used for the commercial show, and in addition the basement of the Coliseum annex was spaced off to accommodate the overflow.

S. A. Miles, Manager



Great Expense of Show Promotion

Assistant Manager Fest Figures Expense Costs $60,000 To Open Coliseum Doors

NOT many realize what it costs to stage a national show. The public pays its money at the door and wanders through the aisles admiring the cars and accessories and "sensing" the beauties of the decorations which are designed to harmonize with the surroundings, but not many pause to wonder how much all this cost, how much effort it took to prepare the Coliseum for the magnificent display of the country's great industry. Doubtless the unthinking would be surprised to know that the actual cost of preparing the show and opening the doors is approximately $60,000. That, however, is only a starter—you haven't figured on how much it costs the exhibitor. A big maker of cars has to have at least a dozen men in attendance at the show; some have thirty.

Of course the exhibitors do not have to pay directly for the decoration of their stands. That is included in what they pay for space, although in many instances the refund re-imburses the lessee of the space for what he puts up for decorations. It used to be that each exhibitor was privileged to adorn his booth as he saw fit, the result being an ill-matched show. After suffering through two or three shows this way the N. A. A. M. finally conceived the idea of uniform decorations which would make it a display of motor cars instead of one of dry goods. But first it was tried elsewhere—during the world's fair at St. Louis. The N. A. A. M. was asked to manage the motor car exhibition at the Mound city and the uniform decoration scheme was first tried there, proving an instantaneous success, saving the exhibitors the trouble and expense of sending men weeks ahead to prepare their booths, while the actual cost of the decoration and equipment was reduced from $2 to $3 a foot to less than 50 cents.

This idea worked out, the show is no longer feared by the maker—it is up to the N. A. A. M. management to do the worrying. How much it has to worry is shown by the immense amount of work necessary to install an exhibition. I recall one show in particular where we had to install nearly 200 tons of stuff, some of it in the most inaccessible places among the girders of the Coliseum; 170,000 feet of bunting was placed; a gallery 20 by 900 feet was prepared; a mile and a half of signs erected; a passage way 8 feet wide and 300 feet long built connecting two buildings; thousands of electric lights hung; 2,000 feet of wood paneling with burlap center pieces put in; 10,000 yards of carpet made and laid; a mile of railing erected, and 150,000 square feet of bunting placed. All this was done in 3 days.

L. L. Fest, Assistant Manager

EXHIBITORS

Jackson Automobile Co....Jackson, Mich.
Kimball, C. P. & Co.....Chicago
Kissel Motor Car Co.....Hartford, Wis.
McIntyre, W. H. Co.....Auburn, Ind.
Meteor Motor Car Co.....Bettendorf, Ia.
Model Automobile Co.....Peru, Ind.
Moline Automobile Co....East Moline, Ill.
Moon Motor Car Co.....St. Louis
Mora Motor Car Co.....Newark, N. Y.
Nordyke & Marmon.....Indianapolis
Overland Automobile Co.....Indianapolis
Rapid Motor Vehicle Co....Pontiac, Mich.
Rauch & Lang Carriage Co....Cleveland
Speedwell Motor Car Co.....Dayton, O.
Staver Carriage Co.....Chicago
Streator Motor Car Co.....Streator, Ill.
Waverley Co.....Indianapolis
Wayne Works.....Richmond, Ind.

COLISEUM—BASEMENT.

Bendix Co.....Chicago
Cameron Car Co.....Beverly, Mass.
Clark-Hatfield Automobile Co.....
.....Oshkosh, Wis.
Emancipator Automobile Co.....Chicago
Grabowsky Power Wag. Co.....Detroit
Interstate Automobile Co....Muncie, Ind.
Mier Carriage & Buggy Co..Ligonier, Ind.
Randolph Motor Car Co.....Chicago
Rider-Lewis Motor Car Co...Muncie, Ind.
Schacht Mfg. Co.....Cincinnati, O.
Thomas, E. R. Motor Co.....Buffalo
Thomas, Owen Motor Co..Janesville, Wis.
Zimmerman Mfg. Co.....Auburn, Ind.

Motor Cycles

COLISEUM ANNEX—SECOND FLOOR

American Motor Co.....Brockton, Mass.
Armac Motor Co.....Chicago
Aurora Automatic Machinery Co.....
.....Aurora, Ill.
Auto-Bi Co.....Buffalo
Consolidated Mfg. Co.....Toledo, O.
Excelsior Motor and Mfg. Co.....Chicago
Harley-Davidson Motor Co.....Chicago
Hendee Mfg. Co.....Springfield, Mass.
Hornecker Motor Mfg. Co....Geneseo, Ill.
Magnet Motor Co.....Chicago
Merkel-Light Motor Co....Pottstown, Pa.
Minneapolis Motor Cycle Co...Minneapolis
N. S. U. Motor Co.....New York
New Era Gas Engine Co.....Dayton, O.
Ovington Motor Co.....New York
Pierce Cycle Co.....Buffalo
Reading Standard Co.....Reading, Pa.
Thiem Mfg. Co.....Minneapolis
Wagner Motor Cycle Co.....St. Paul

Accessories

COLISEUM—BASEMENT

Bosch Magneto Co.....Chicago
Buda Foundry & Mfg. Co.....Chicago
Champion Ignition Co.....Flint, Mich.
Chicago Recometre Co.....Chicago
Chicago Wind Shield Co.....Chicago
Fellwock Auto & Mfg. Co.....
.....Evansville, Ind.
Flentje, Ernst.....Cambridge, Mass.
Fulton & Zinke.....Chicago
Garage Equipment Co....Milwaukee, Wis.
High Wheel Auto Parts.....Muncie, Ind.
Longdin-Brugger Co...Fond du Lac, Wis.
Nadall Mfg. Co.....Chicago
Norton Co.....Worcester, Mass.
Wheeler, F. H.....Indianapolis, Ind.
Whitney Mfg. Co.....Hartford, Conn.
Walton Motor Co.....Lynbrook, L. I.

EXHIBITORS

COLISEUM ANNEX—SECOND FLOOR

Ajax-Grieb Rubber Co.....New York
Bower Roller Bearing Co.....Dayton, O.
Brandenburg & Co.....Chicago
Chase, L. C.....Boston, Mass.
Connecticut Telephone and Electric Co. .....Meriden, Conn.
Continental Caoutchouc Co.....New York
Cook's, Adam, Sons.....New York
Dixon Crucible Co., Jos. Jersey City, N. J.
Empire Automobile Tire Co.....
K-W Ignition Co.....Cleveland, O.
Pfanstiehl Electrical Laboratory..... .....North Chicago, Ill.
Royal Equipment Co....Bridgeport, Conn.
Sparks, F. E.....Chicago
20th Century Motor Car Co..... .....South Bend, Ind.
Triple Action Spring Co.....Chicago
Troy Carriage Sun Shade Co....Troy, O.
Vanguard Mfg. Co.....Joliet, Ill.
Vehicle Top and Supply Co.....St. Louis
Zimmerman Mfg. Co.....Auburn, Ind.

COLISEUM—GALLERY

American Elec. Nov. and Mfg. Co..... .....New York
Atwater Kent Mfg. Works...Philadelphia
Auto Improvement Co.....New York
Badger Brass Mfg. Co.....Kenosha, Wis.
Baldwin Chain and Mfg. Co..... .....Worcester, Mass.
Bowser, S. F. & Co., Inc..Ft. Wayne, Ind.
Brown-Lipe Gear Co.....Syracuse, N. Y.
Byrne, Kingston & Co.....Kokomo, Ind.
Chicago Battery Co.....Chicago
Cook's Standard Tool Co..... .....Kalamazoo, Mich.
Cramp & Sons Ship and Engine Building Co.....Philadelphia
Diamond Chain and Mfg. Co..Indianapolis
Diamond Rubber Co.....Akron, O.
Dietz, R. E. & Co.....New York
Duff Mfg. Co.....Pittsburg
Edmunds & Jones Mfg. Co.....Detroit
Electric Storage Battery Co..Philadelphia
Firestone Tire and Rubber Co..Akron, O.
Fisk Rubber Co....Chicopee Falls, Mass.
G & J Tire Co.....Indianapolis
Gabriel Horn Mfg. Co.....Cleveland
Goodrich, B. F. Co.....Akron, O.
Goodyear Tire & Rubber Co....Akron, O.
Gray & Davis.....Amesbury, Mass.
Hancock Mfg. Co.....Charlotte, Mich.
Harris, A. W. Oil Co.....Providence, R. I.
Hardy, R. E. Co.....New York
Hartford Rubber Works Co..... .....Hartford, Conn.
Hartford Suspension Co..Jersey City, N. J.
Heinze Electric Co.....Lowell, Mass.
Imperial Brass Mfg. Co.....Chicago
Jones, J. W.....New York
Kokomo Electric Co.....Kokomo, Ind.
Long Mfg. Co.....Chicago
McCord Mfg. Co.....Detroit
Morgan & Wright.....Detroit
Motor and Accessories Manufacturers' Office .....
Motsinger Device Mfg. Co..... .....Pendleton, Ind.
N. Y. & N. J. Lubricant Co....New York
National Carbon Co.....Cleveland, O.
Never-Miss Spark Plug Co..... .....Lansing, Mich.
Oliver Mfg. Co.....Chicago
Pantasote Co.....New York
Pennsylvania Rubber Co...Jeannette, Pa.

Character of Show Attendance

National Event Attracts Kindred Spirits
Farmers Are Friendly Toward Motoring

SINCE the early days of the industry there has been a great change in the attendance at the national show. It used to be that the shows were given with the one idea of attracting the agents so that the manufacturers could get in touch with them and thus dispose of their outputs. The retail trade received little attention. Now, however, the makers have closed their contracts with their agents months before the show, but this fact does not keep the dealers away. They come just the same as usual, but now they bring with them their prospects, the "live ones" who want to be shown. This phase greatly assists in increasing the attendance.

That the national show is beneficial to the industry as a whole cannot be denied. While the maker is not looking to dispose of his entire output at these affairs, the annual exhibition permits of a meeting of kindred spirits, a gathering of the clans, as it were. The agents come and from them the makers hear friendly criticism of their goods; the retailers come and again the makers profit through feeling the pulse of the buying public; the designers come and on common ground see what the other fellows have been doing, and altogether it is one big session which arouses general enthusiasm over motoring and helps the industry.

It would not be a wild guess to predict that 120,000 people will see the Chicago show. It is impossible to get a true line on this because of the thousands of attendants of the use of whose tickets it is impossible to keep account; but Chicago always has turned out record-breaking crowds.

Chicago always has attracted the farmers and the management of the Coliseum show caters to this class, for it recognizes that the ruralite is not the enemy to motoring he is supposed to be. Your modern farmer generally has a car of his own and he is as interested in the subject of good roads as is the city chap who owns a machine. It is to accommodate the farmer and the country agent that the doors of the Coliseum open at 8 o'clock each morning, although 10 o'clock is the scheduled hour. The farmer and the country agent are early birds and often they go direct from the depot to the show, desiring as much time for inspection of the cars as it is possible to get. Therefore, it has been no unusual sight at previous shows to see a crowd at the doors at 8 o'clock, most of the waiters carrying grips and satchels, and having postponed going to the hotels until they have been through the buildings. In a way these early birds profit, for they see the show at a time when the aisles are comparatively clear.

Why Chicago Is National Show

Rights of the West to This Classification Rapid Growth of Promoting Organization

CHICAGO'S show has been styled the national exhibition, the one big show of the year, and such it has been for the last 5 years. This may be denied in New York, the residents of which truly believe their two efforts should properly come under this classification, but in the west the feeling is that Manager Miles has not exaggerated when he styles his the "national" show. Undoubtedly, the westerners say, the east might have had some claims to recognition before the split came which resulted in two shows in New York, one under the auspices of the A. L. A. M. and the other given by the A. M. C. M. A., but now Chicago has forged to the front and presents an exhibition in which both sides come together peaceably and work for the common good. It will be remembered that the National Association of Automobile Manufacturers was organized some 10 years ago and as the parent body it conducted all the national shows. Then the A. L. A. M. came into being, and closely following it was the A. M. C. M. A. The two clashed over the show proposition in New York and in consequence there was a division of the membership of the N. A. A. M., which, however, was confined to the show question alone. On all other matters the members of the N. A. A. M. have agreed and continue to agree.

When each of the rival factions in Gotham promoted a show that took away from New York the national prestige, it is claimed, Chicago gaining the undivided glory through maintaining its organization and securing for exhibitors makers from each of the newer organizations. This supremacy has been maintained ever since. New York now has had two shows annually for the last 3 years, for neither of which can be claimed national characteristics. This state of affairs as regards the national status undoubtedly will continue, claim the wise ones, until such time as the Selden patent case is settled, when the officers of the N. A. A. M. hope to see the trade re-united, and there be two national shows, one in Chicago and the other in New York.

Meanwhile the N. A. A. M. is pursuing the even tenor of its way and to it are referred all matters of legislation, road improvement, tariff questions and all other matters in which the opposing factions have a common interest. Its show does not discriminate in favor of either the licensed or the unlicensed and the two factions meet on common ground, draw for choice of space and everyone is on an equality.

"The Chicago show always has maintained its truly national character," says Manager Miles, "and the rivals have made no serious attempt to force their fight into show matters or to interfere with the national association's control."

EXHIBITORS

Pratt Mfg. Co., Wm. E.....Chicago
Rands Mfg. Co.....Detroit
Remy Electric Co.....Anderson, Ind.
Republic Rubber Co.....Youngstown, O.
Shaler, C. A. Co.....Waupun, Wis.
Shelby Steel Tube Co.....Pittsburg
Smith, A. O., Co.....Milwaukee
Spicer Universal Joint Mfg. Co.....Plainfield, N. J.
Splitdorf, C. F.....New York
Sprague Umbrella Co.....Norwalk, O.
Swinehart Clincher Tire and Rubber Co.....Akron, O.
Timken Roller Bearing Axle Co.....Canton, O.
Valentine & Co.....New York
Veeder Mfg. Co.....Hartford, Conn.
Vesta Accumulator Co.....Chicago
Warner Gear Co.....Muncie, Ind.
Warner Instrument Co.....Beloit, Wis.
Weed Chain Tire Grip Co.....New York
Consolidated Rubber Tire Co...New York
Gemmer Mfg. Co.....Detroit
Globe Machine and Stamping Co.....Cleveland, O.
Gray-Hawley Mfg. Co.....Detroit
Ham Mfg. Co.....Rochester, N. Y.
Hoffecker Co.....Boston
Leather Tire Goods Co.....Newton Upper Falls, Mass.
Limousine Carriage Mfg. Co.....Chicago
Michelin Tire Co.....Milltown, N. J.
Milwaukee Motor Co.....Milwaukee, Wis.
Mosler & Co., A. R.....New York
Motz Clincher Tire and Rubber Co.....Akron, O.
National Battery Co.....Buffalo
National Coil Co.....Lansing, Mich.
Pittsfield Spark Coil Co.....Dalton, Mass.
Randall Faichney Co.....Boston
Ross Gear & Tool Co.....Lafayette, Ind.
Sager, J. H. & Co.....Rochester, N. Y.
Stewart & Clark Mfg. Co.....Chicago
Whiteley Steel Co.....Muncie, Ind.
Witherbee Igniter Co.....New York

FIRST REGIMENT ARMORY—GALLERY

Arnstein, Eugene.....Chicago
Austro-American Separator Co..Cleveland
Breakstone, S.....Chicago
Central Rubber Co.....Chicago
Commercial Battery Electric Co..Chicago
Dayton Rubber Mfg. Co.....Dayton, O.
Elite Mfg. Co.....Ashland, O.
Ennis Rubber Mfg. Co.....Newark, N. J.
Excelsior Supply Co.....Chicago
High Frequency Ignition Co.....Los Angeles, Cal.
Knight, H. C. & Co.....Chicago
Legnard Bros., Inc.....Waukegan, Ill.
London Auto Supply Co.....Chicago
McCanna Mfg. Co.....Chicago
Morrison-Ricker Mfg. Co.....Grinnell, Ia.
Neely & Co., Edward.....Chicago
Perfection Demountable Tire Co.....Boston, Mass.
Quincy, Manchester, Sargent Co.....Plainfield, N. J.
Rochester Safety Lock Co..Rochester, Ind.
Rochford, T. J. & Co.....Chicago
Smith, Fred W.....Aberdeen, S. D
Standard Tire Protector Co.....Saginaw, Mich.
Standard Varnish Works.....Chicago
Stromberg Motor Devices Co.....Chicago
Universal Tire Protector Co..Angola, Ind.
Vivax Storage Battery Co.....Chicago

Carbureting Principles

IT is a peculiar fact that of the 250 American makers of gasoline cars not more than twenty manufacture their own carbureters, the rest purchasing their supply from the carbureter makers. From the standpoint of economy of manufacture, and it might be said efficiency, this course of buying from the carbureter maker would appear preferable. It is natural that every man should be heard, and the carbureter manufacturer, who devotes all of his time to the study of carburating principles, should have solved the problem better than the carmaker, whose engineers and designers have to be busy over the problems of motor, clutch, transmission and running gear design, as well as the selection of proper ignition system, and other car accessories. It is a very conspicuous fact that of the approximately two score makers who design and manufacture their own carbureters their line of manufacture is along considerably different lines than those followed by the accepted carbureter builders.

The carbureter manufacturer has devoted a great deal of attention to the concentric-float design, by which is meant that a ring, crescent, horseshoe or other shaped float is used, and the spraying nozzle is in the center of it. The object of this being that, when going up or down hills, the level of gasoline in the float chamber always remains practically the same as that in the nozzle, so that there is little danger of the level in the nozzle getting too low at one time and overflowing at another time. The reader will understand how this would happen were the float chamber nearer to the front than the nozzle, and under which conditions there would be an extra supply or overflow in the nozzle when climbing the hill, whereas if the float were in the rear of the nozzle there would be a dearth of gasoline when making an ascent.

Big Car Men Make Own Carbureters

The big car makers manufacturing their own carbureters, however, as has been done in Europe, continue the use of the separate float chamber, with one or two exceptions. In several of these designs, however, the nozzle is placed very close in the wall of the float chamber, and in one or two cases it is closer to the crankcase than the float chamber, so there is not any difference in the level of the float chamber and that in the nozzle when ascending or descending hills. It is further true that car makers have generally more adjustments on their carbureters than have the standard stock made carbureters.

Having briefly noted the great difference in construction between car manufacturers building their own carbureters and the regular carbureter maker, it will prove opportune to look at a few of the trends shown in carbureter design during the last year. Briefly surveying the American and European field, the great change has been towards simplicity; and although that advance towards the elimination of all springs for the control of valves and other parts, which was prophesied a year ago, has not taken place, two or three of the makers have taken not a few strides in that regard. The Kingston carbureter uses the ball auxiliary air valve instead of the spring-controlled poppet type, and in Europe the de Dion company, which is properly regarded as one of the pioneer makers of the Old World, has discontinued the two-part carbureter in which the float chamber was at the side of the motor and the mixing chamber close to the intake valves on the opposite side. In place of this two-part combination the company has adopted the Zenith type, described in Motor Age in an issue during the past fall, in which not a spring of any nature is used. The Winton carbureter is practically free from spring control of any nature, as are the Franklin and Holley.

Spring Control Is Used

In contrast with these is the great number of makers employing spring control of one nature or another. In the excepted carbureter field such makers as Wheeler & Schebler, Stromberg, Breeze, Bell, Heitger, Bowers and others continue the use of springs of one nature or another for the regulation of intake air. In addition to these are such car manufacturers as Locomobile, Packard, Stearns, Pierce, Stevens-Duryea, Pope-Toledo,

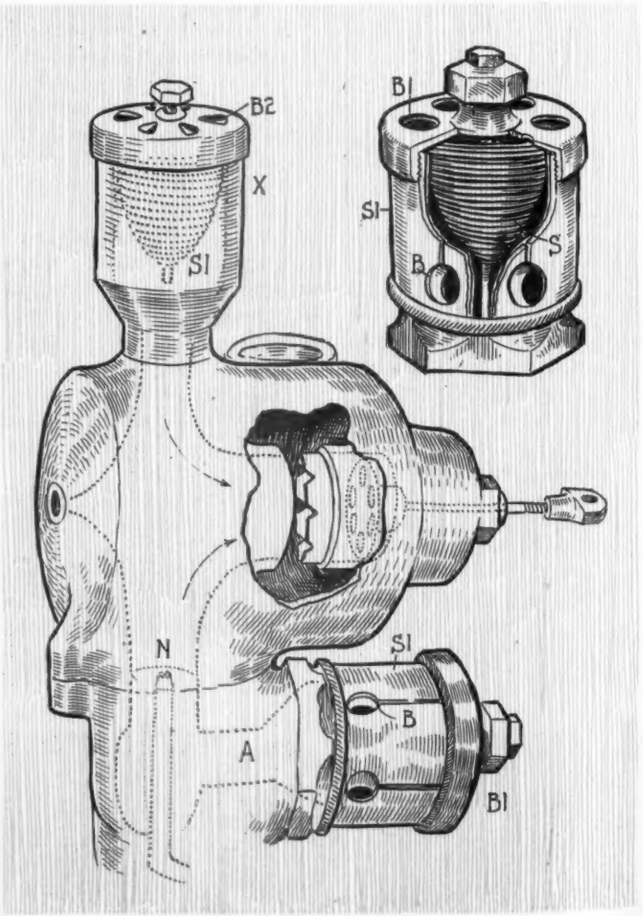
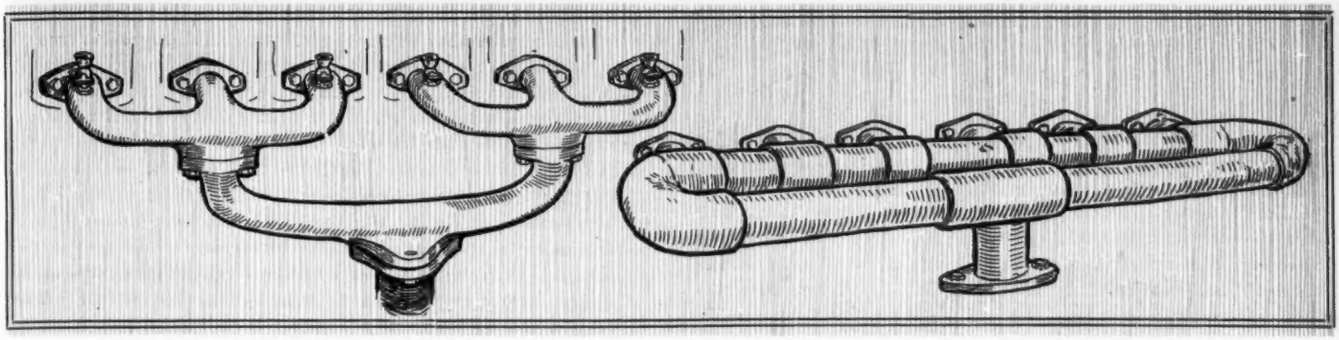


FIG. 1—LOCOMOBILE HAS TWO AUXILIARY AIR VALVES



COMPOUNDED BRANCHING OF AUSTIN INTAKE PIPE

PITTSBURG SIX-LOOP TYPE OF INTAKE PIPE

Gaeth, Mora and others employing springs. Of these some employ the spiral spring, some the flat-leaf spring, and others use a combination of two springs. The majority of car makers have been content during the past year with leaving their carbureters as they were in 1908, although some have made alterations.

Something quite out of the ordinary is found in the double auxiliary air system of the Locomobile, illustrated in Fig. 1, in which the main air passage A receives its supply through a fixed set of openings B, the size of which can be regulated by a sleeve S1, permitting of hand movement whereby any degree of opening at the entrance of B is possible, the illustration showing these open to the half. In the upper right is shown a detail of this main air opening, with the casing partly broken away, revealing a spiral spring S, in which the coils are packed closely one against another and fit so tightly that air cannot pass between them. As soon as the openings B fail to give the normal demand of air, additional air enters through a series of openings B1 in the head of the casing, the air from these having to pass between the coils of the spring S, so that before this air enters the suction of the motor must overcome the tension of the spring S. This auxiliary air is for low motor speeds, and it is presumed that the spring S begins opening at a crankshaft speed of 300 revolutions per minute or thereabouts. When, however, the motor demand is such that sufficient air cannot enter by way of openings B and B1 the auxiliary air valve X comes into operation, which contains a spring S1, exactly similar to that in the regular air intake, but which differs in that it is of stronger tension and only comes into operation at crankshaft speeds of 500 revolutions or higher. It must be noted that all of the air through the normal openings B and B1 passes the nozzle N, whereas that through the openings B2 of the auxiliary air valves does not pass the nozzle, thereby working against the obtaining of too rich a mixture at high engine speed. This is the first example Motor Age is aware of in which two auxiliary air valves are used, one for low speeds, the other for high; one in which the supply of air passes the nozzle and the other in which it does not. The result of the first auxiliary valve for low speed work is that it is conducive to a richer mixture at low speeds than were the carbureter without it. This Locomobile carbureter is one example of the delicacy of adjustment that many makers are aiming at, which is shown by the sleeve S1, to regulate the main air openings and by the regulation of the openings B1 and B2. It should be noted that no arrangement is made to vary the spring tension in these auxiliary valves.

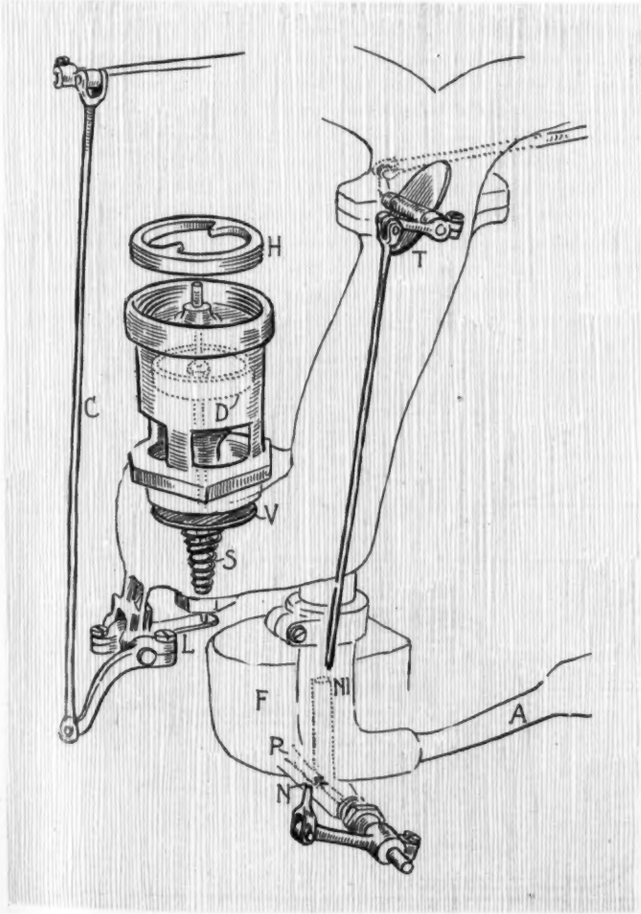


FIG. 2—STEVENS-DURYEA'S NEW CARBURETER

New Stevens-Duryea Type

The Stevens-Duryea company, which has always shown more than the ordinary enterprise in the carbureter field, has ready a new 1909 type, which has been the subject of much experimenting and which has been in use for a considerable time. It is of the one-jet type and contrasts with the two-jet principle exploited by this concern for several years; and one of the most notable features of it is the control of the needle valve and the auxiliary air valve from the dash of the car. Further, the throttle and needle valve in the nozzle are inter-connected, so that there is a proportioning of gasoline and air at all times. Fig. 2 shows the general layout of the carbureter with its throttle T entirely separated from the carbureter proper and located in the intake pipe, where it branches to the cylinder casting. The needle valve N is mounted horizontally and designed to close the horizontal passage P from the float chamber; whereas, the nozzle is a standpipe N1 located slightly above the gasoline level of the float chamber F. The intake air passage A, of varying diameter, is very much reduced where it enters the mixing chamber. Particular effort has been placed upon the auxiliary air valve, in that the valve V, held shut by a spring S, is so designed that the tension of this spring can be varied by the driver on the dash of the car. This is accomplished by a connection C, which, through

a bellcrank, bears upon a leaf-spring L, this spring contacting with a support for the spring S, so that the tension of the spring S can be increased or diminished, according to climatic conditions, by raising or lowering the spring-leaf L. Where arrangements of this nature are provided it would be possible by greatly increasing the tension of the spring S, just before stopping the motor, to draw a particularly rich charge into the cylinders, which would make starting somewhat easier. An improvement in conjunction with the auxiliary air valve is the carrying on the valve stem of a disk D operating in an enclosed chamber against an air pressure on either side, and introduced to prevent unnecessary fluttering of the valve. The construction is, in short, a dashpot type of arrangement, not intended in any wise to restrict the action of the valve V, but solely for the prevention of unnecessary fluttering. The locking ring H is for holding the top of the casing in place, and with it removed the diaphragm D can be reached. This carbureter is carried particularly low down on the crankcase and the weight of the float chamber is taken directly on the crankcase through a bracket.

Peerless System Is Explained

The Peerless gasoline system, diagrammatically illustrated in Fig. 3, contains an emergency gasoline supply for the prevention of being caught on the road without fuel. The lower, or main part, of the tank T contains the main fuel supply, which reaches the carbureter through the branch pipe P connecting with the main one at the strainer J. The auxiliary, or emergency, gasoline supply is carried in the top of the tank in the compartment T1 and is conducted through the strainer by way of the pipe P1. At the junction of the pipes P and P1 is a valve arrangement K, in which the handle H is shown in the off position when the two pipes P and P1 are closed. Turning the handle to the position of H1 draws from the emergency tank, and bringing it to the position of H2 draws from the regular service tank. The filler cap F on the gasoline tank covers the openings to the main and emergency tanks, making it impossible to fill one without due respect to the other.

Coming to the carbureter proper, it is of the waterjacketed type, water being taken from valve chamber through the pipe W and passed on to the radiator through the pipe W1. A special cold air control is provided at the main air opening, and by rotating the lever C it is possible to vary the size of the main air openings A. In this carbureter the nozzle N enters the venturi-tube shaped mixing chamber at an angle. The auxiliary air valve V is in a separate compartment and is of the usual spring-controlled type with adjustable springs. The tension of the auxiliary valve spring is regulated by a screw at the top, and the lift of the valve by a screw at the bottom. The throttle T is a cone-shaped double-seated valve, one seating at S, the other at the opposite end E1. The air passing the seating S1 passes through the center of the throttle cylinder, as indicated by the arrows; whereas that which escapes by the seating S does not enter the throttle valve. The design is such that air passes by the seating S first, and after a distance of opening begins to pass by the seating S1. The throttle is actuated from the governor and also by the accellerator on the footboard of the car. The float design in this carbureter is that of the loose type, in that the float is a sliding fit on the needle valve stem.

Details of Packard System

Three systems are of interest in the Packard carbureter and gasoline system: First comes the hydraulic governor, which operates on the throttle valve; second is the method of varying the tension of the auxiliary air valve spring from the dash; third comes the emergency tank system, and to these might be added a fourth, namely, waterjacketing the intake pipe from the carbureter to the horizontal part connecting with the twin-cylinder castings. Fig. 4 shows the auxiliary air valve contained within a housing H and held seated by two springs S and S1, the former of larger diameter than the latter and so adjusted as to come into action in advance of the smaller one. The large spring S begins compressing with low motor speeds, and as the crankshaft speed increases it is assisted by the other spring in resisting the opening of the auxiliary air valve. In varying the tension of these the usual method of nut and locknut is not reverted to, but a wedge W is made to enter beneath a support K, on which both of the springs controlling the valve rest. With the wedge partly entered, as illustrated, the valve will open at low motor speeds, and inserting the wedge to the full extent vastly increases the tension of the spring, making it harder to open the valve. Advantage is taken of this arrangement by entering the wedge to its full just before stopping, so that a richer mixture is obtained and which makes starting easier. As the tension of the springs S and S1 varies through continued use, this is taken up by a slightly greater insertion of the wedge. The wedge is controlled from a small lever on the dash. On the carbureter is also fitted a starting valve M, which is but a butterfly in the main air intake pipe. It is normally held open by a spring and may be closed by a pull button at the front of the radiator. Its service is the same as that of any other starting valve, in that it greatly obstructs the air opening and creates a

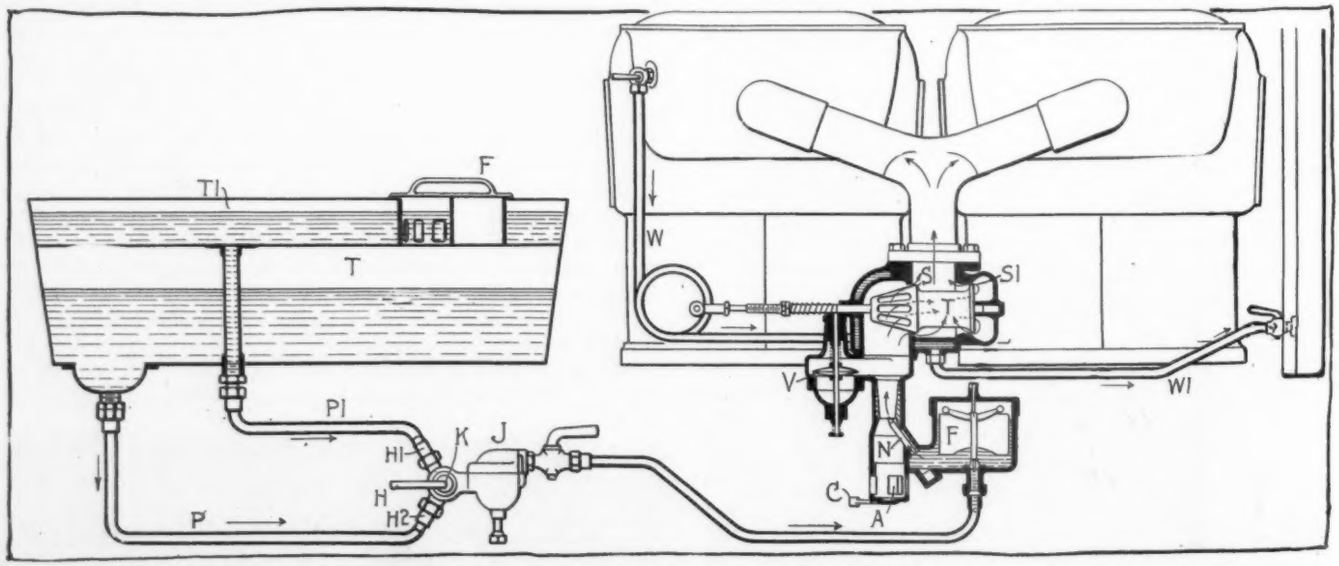


FIG. 3—GASOLINE SYSTEM AND CARBURETER IN PEERLESS CARS

stronger suction pull on the gasoline in the nozzle, thus insuring an adequate supply to start upon. In this carbureter the throttle T is manually controlled and in addition is operated upon by a diaphragm, against one side of which the water in the cooling system bears, so that with the faster the motor speeds the greater the pressure upon this diaphragm and the more is it bulged outward by the water pressure. This diaphragm at the other side has a linkage connection with the throttle so arranged as to partly close it above certain motor speeds.

Packard Emergency Gasoline System

The Packard emergency gasoline system consists of a casting C secured to the underside of the gasoline tank. This casting has a standpipe S, the top of which is 3 inches above the bottom of the tank. Normally the gasoline escapes through this standpipe and through the piping P to the carbureter. The emergency system consists in that as soon as the gasoline falls to the level of the standpipe S it ceases flowing, but there still remain 3 inches in the bottom of the tank which cannot, however, be drained through this pipe. It can, however, be used through the opening S1, which is on a level with the floor of the tank, and through which gasoline is ordinarily prevented flowing by a rotating valve V. When the regular running supply is exhausted it is but necessary to give the valve V a part rotation, which is accomplished from the end of the seat, and after which all of the gasoline may be drained through the pipe S1. The construction of the valve V is shown in detail, it being an ordinary three-way valve, allowing the gasoline to be drawn through the standpipe S when as illustrated. Giving it a quarter revolution leftward would allow of drawing from the emergency supply to the orifice S1. Giving it a complete half revolution leftward would result in shutting off the entire supply from the tank. The main part of the casting C is a sediment chamber, from which all dirt collecting can be drained off.

In the waterjacketing system of the Packard carbureter the entire pipe forming the mixing chamber is waterjacketed and a by-pass is arranged where, by the arrangement of an adjusting screw, the amount of water passing through the waterjacket is regulated.

Pierce Carbureter of Concentric Type

The Pierce carbureter is one of the concentric type and has a special arrangement whereby the normal air opening can be varied, according to demands. A peculiar type of auxiliary air valve is used, illustrated in Fig. 5, in which the regular coil spring method of valve control is eleminated, and in its place a flat-leaf spring L is employed to close each of the auxiliary openings, of which there are two, one P shown in the illustration and the other located diametrically opposite to it. A certain amount of pressure is required to overcome the spring L, and when this is accomplished and the opening begins additional resistance is offered by a reed R, which backs up the spring L and really serves as a second spring to greatly restrict the opening beyond a certain limit. Both the spring L and the reed R are anchored at their upper ends, as may be seen. Over the complete auxiliary air valve system fits a fine mesh wire screen S for the filtering of the air. A waterjacketing system is employed on the carbureter, and the throttle used is of the revolving cylinder type, located horizontally and directly above the truncated cone-shaped mixing chamber. As in the majority of carbureters, the air supply from the auxiliary air valve does not pass the nozzle.

Franklin a Springless Carbureter

The Franklin is one example of the springless carbureter, and, as shown in Fig. 9, in which the main construction appears, not a spring of any nature enters in its make-up. The main air entrance A is at the base, and the exit E at the top, with B marking the auxiliary air passage. A marked peculiarity in this carbureter is that the throttle T and the auxiliary air valve V are under the same control of the lever L, the inter-connection being such that, when the throttle T opens to a certain extent, the auxiliary valve V begins opening; thus the vacuum around the nozzle N is reduced. This method of control is not unlike that employed in carbureters where the needle valve in the spraying nozzle is connected with the throttle, and there is a proportionate control of the mixture and the gasoline. In the Franklin it will be noted that with the valve V open a large percentage of the air enters the passage and the motor pull on the nozzle N is reduced for high-speed work. A novelty in this carbureter is a disk starter valve H, which is a loose fit on its stem. With the motor at rest the valve, as illustrated, rests on its seating, entirely obstructing the air passage A, but immediately the motor is started it is held away from its seating and against a shoulder

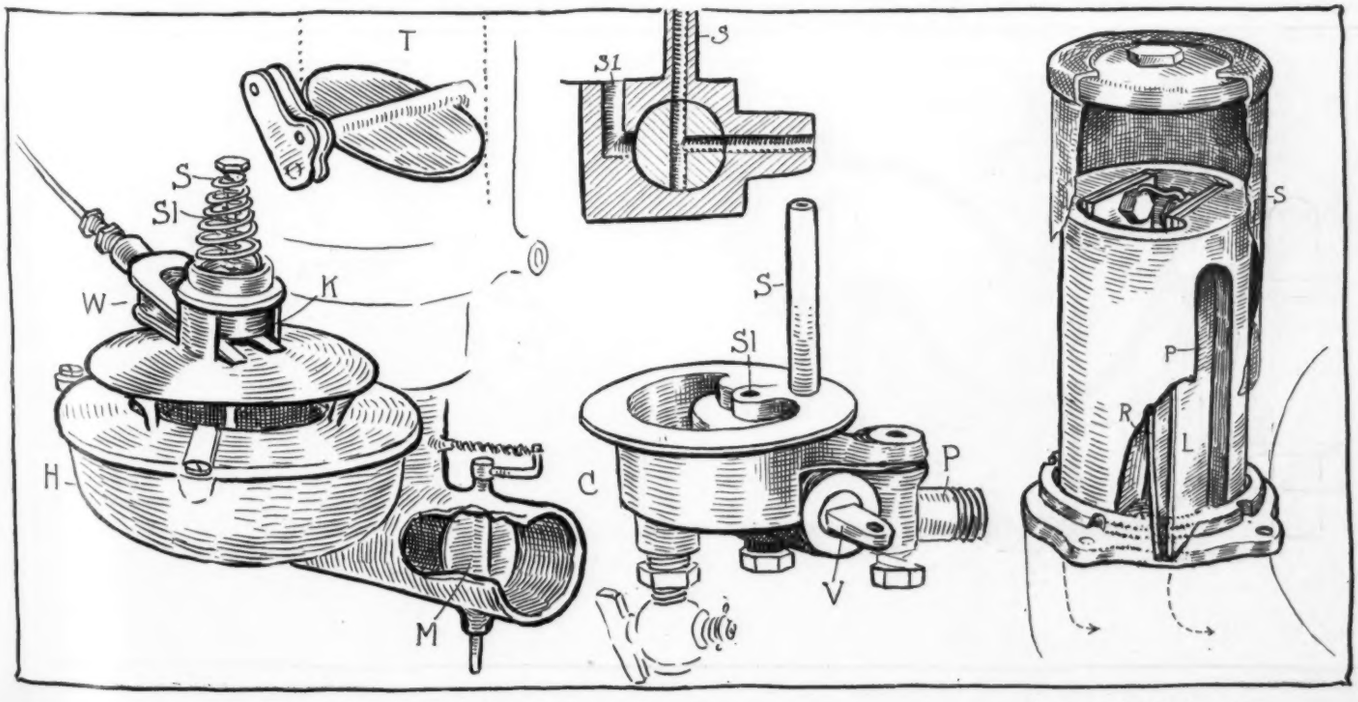


FIG. 4—PACKARD AUXILIARY VALVE AND STRAINER

FIG. 5—PIERCE AIR VALVE

on its stem. Springs are not used in conjunction with this valve. The nozzle N, as illustrated, is a multiple one, having four jets instead of one, each directing its gasoline flow against the narrowest part of the mixing chamber wall, and at which point the tendency to break up the gasoline flow is greatest.

The double-jet carbureter is not so generally in vogue as it was a year ago, but two examples of it are the Winton and Stearns, both of which are continued practically in unchanged form for the 1909 season. The Winton carbureter is of the puddle type, illustrated in Fig. 10, and the air entering by the passage A and is directed downwards to an elbow which dips into the top of the float chamber F, and at the angle of which elbow is the needle valve N guarding a nozzle, so located that it is slightly below the level of gasoline in the float chamber, so that with the motor at rest there is just a drop or so of gasoline lying in the bottom of the elbow. Because of this, this type of carbureter has been designated the puddle type. The air once past this point rises in the other arm E, guarded by the throttle T. The gradual restriction of the passages A and E as they converge at the elbow produces a venturi tube effect, and makes the velocity of the air at that point greater, thereby assisting in vaporizing the gasoline. The general layout of the double-nozzle system appears with the large air passage A at one side and the smaller A1 beside it, each with its respective exit pipes E and E1 and adjustable needle valves N and N1. The smaller air passage A1 is used first, after which the larger one is brought into action. A double throttle T and T1 is used, both butterflies, controlled by the same lever L but differently set, so that an earlier opening in one is accomplished than in the other. As will be noted from the illustration, this is a double carbureter in every sense of the word, there being two intake pipes, two throttles and two nozzles, the only violation of the double system being the employment of one float chamber and one float, which furnishes the complete supply.

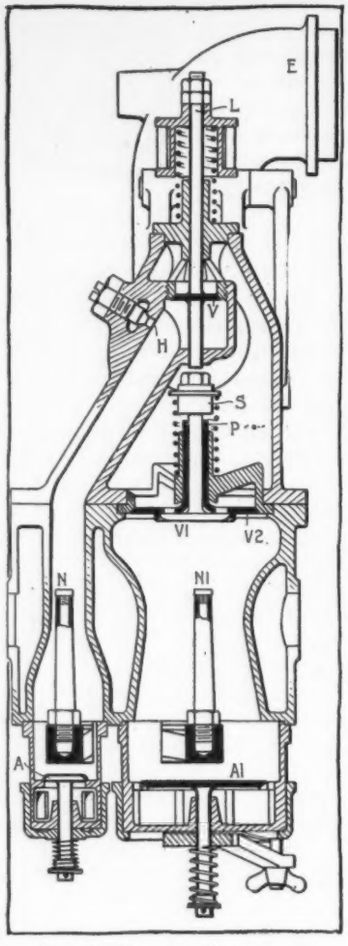


FIG. 6—STEARNS CARBURETER

No other car has devoted more effort on the carbureter than has the Stearns company, which carbureter is of the double-nozzle type and offers four distinct controls. As illustrated in Fig. 6, the two nozzles N and N1 are in separate mixing chambers, having separate air entrances, separate venturi-shaped compartments, and separate throttle valves controlling the escape of the mixture from them. The nozzle N is used up to 30 horsepower, and above this the big nozzle N1 comes into operation. One float chamber supplies both nozzles. To keep the motor just running with the car standing by the curb, air enters a fixed opening and passing the nozzle N follows the course of the arrow H through a small opening regulated by a cone-tipped adjusting screw, and thence finds its exit to the motor through pipe E. For the second control the plunger L is depressed by manual control, opening the valve V, which brings the nozzle N into operation, and the supply of air required raises the spring-controlled valve A which guards the opening. This allows of power as high as 30 horse. A further depression of the plunger L opens the throttle V1, thereby bringing the big nozzle N1 into operation. The bringing of this nozzle into operation opens the spring-controlled normal air valve A1. The fourth control is by opening the throttle valve V2, formed concentrically with the valve V1. This is accomplished as soon as the plunger L is sufficiently forced down so that the shoulder S on the valve stem V1 bears upon the sleeve stem P of the larger valve V2. To briefly recapitulate the quadruple Stearns control: First comes the small supply through the opening H; next the full capacity of the small nozzle past the valve V; third, bringing the big nozzle N1 into operation by opening the valve V1; and, fourth, bringing this nozzle to its fullest capacity by opening the valve V2. The three throttles V, V1 and V2 are all controlled by the plunger L on the steering column.

Details of the Holley

The Holly carbureter, Fig. 7, is an example of the springless type and consists of a single vertically positioned elbow-shaped

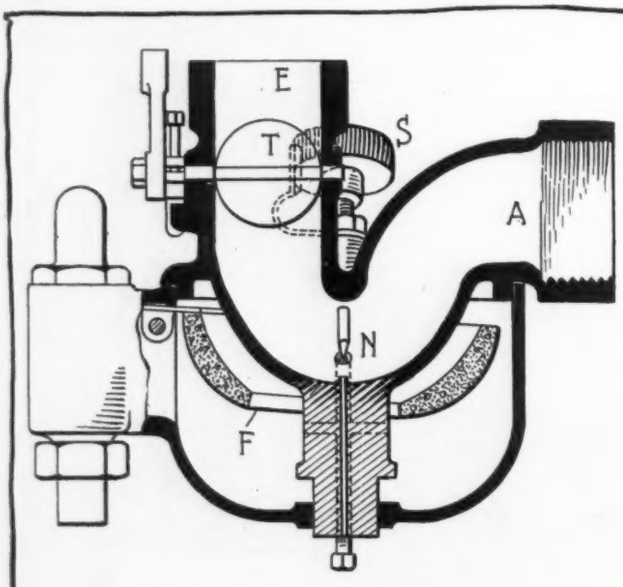


FIG. 7—THE 1909 HOLLEY CARBURETER

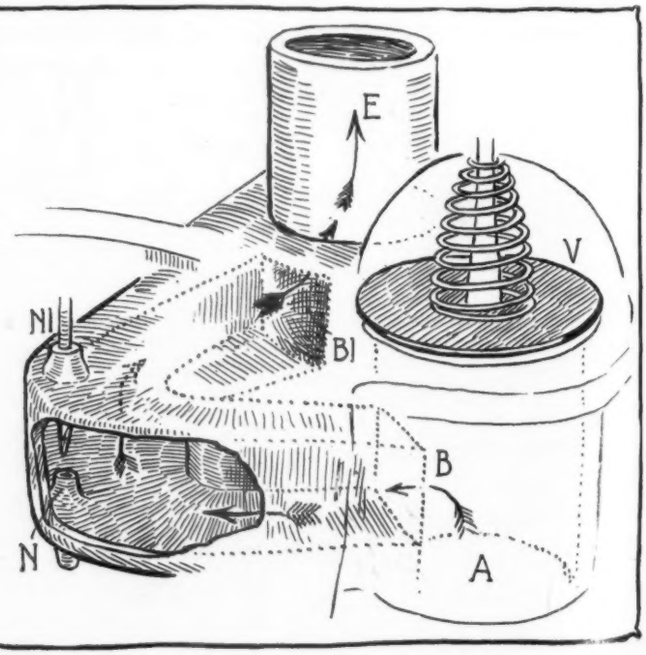


FIG. 8—MIXING CHAMBER OF BELL CARBURETER

air passage, the lowest part of which dips into the top of the float chamber, so that the nozzle N is practically on a level with the gosoline in the chamber. The 1909 improvement consists in serragating the edge of the head S of the adjusting needle valve in the nozzle and the addition of a spring to hold this at any desired adjustment. The top of the adjusting screw is graduated from 1 to 0, so as to enable the driver to maintain a known regulation. This carbureter and the Winton are designed along very similar lines, excepting that, as previously stated, the Winton makes use of two nozzles, two mixing chambers and two throttles, as compared with the one employed in the Holley.

A new carbureter and one of peculiar construction is the Bell, manufactured at Aurora, Ill. The unique feature of this carbureter is shown in the illustration, Fig. 8, in which the mixing chamber is a horizontal V passage extending into the float chamber, with the nozzle N located at the angle. The regular air supply entering by way of the passage A turns to the left at B into the elbow passage, which is of restricted diameter in order to increase the speed of the inrushing air. Because of the location of the nozzle N and the restriction of the tube at that part, a particularly good vaporization of the gasoline is accomplished. Once past the nozzle the mixture takes the other arm of the V to the exit B1, where it makes an abrupt right angle turn upward to the valves. The auxiliary air valve V in this carbureter is a spring-controlled one, the air for which enters at the same entrance as the regular air, but the valve offers a short cut between the ends of the V channel, and the auxiliary air enters the mixture at right angles close to the exit of the V passage to give quicker action.

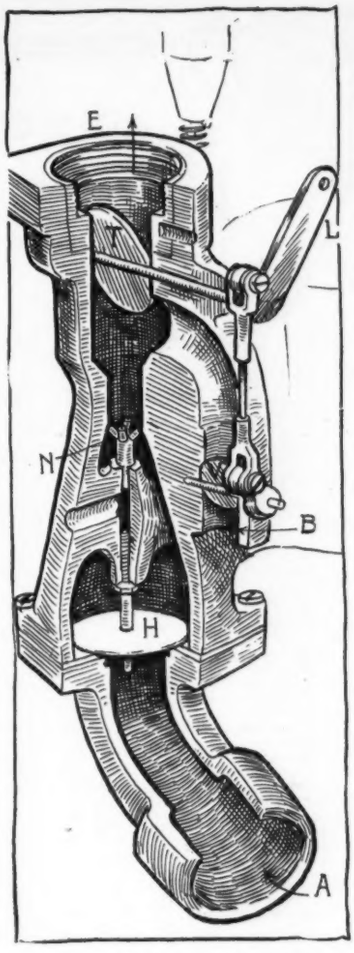


FIG. 9—FRANKLIN CARBURETER

The Bell carbureter is interesting from one or two other points of view, one of which is the float suspension. At one side of the float chamber cover is pivoted a triangular lever, the apex of which has a socket for accommodating the ball end on the top of the float stem. This ball and socket supporting of the float relieves it from every possible side stress and the lower end of the needle valve ends in a ball which fits in a socket in the center of the base of the triangular float lever. This ball and socket supporting of the float and operation of the needle valve is, in addition to the elbow-shaped mixing chamber, one of the features of the carbureter. Another interesting point is that the adjustable needle valve in the nozzle is not of the conventional cone-tipped type, but resembles a lead pencil sharpened on one side only.

It is of particular interest to note that a great many makers regularly fitting stock made carbureters have slight alterations made in these, which seem to better adapt the carbureter to the particular needs of the engine. With one style of motor the difficulty is securing a suitable adjustment for low speeds; with another the trouble is in conjunction with high speeds, all of which are provoked by peculiarities of the operations of the motor. In such cases more than ordinary adjustment is needed at the start, but once these are obtained the results have been as good as where a specially designed carbureter is employed. During the past autumn Motor Age representatives observed several carbureters being extensively experimented with. In one case the engineer was attempting a dashpot control on the needle valve through the medium of the auxiliary air valve. In another case the efforts were centered on inter-connection system between the auxiliary air valve and the needle valve; whereas, fourth was laboring over the correlation of the throttle and auxiliary air valve by manual control. These cases are merely cited to show the activity that is being displayed in carbureter research. The great aim is to increase the efficiency of the motor without increasing the bore or stroke, and this has led to research in carburation, ignition, etc.

In increasing motor efficiency without actually adding to the cylinder volume much latitude for experimental work rests. One maker agrees he can get 5 miles an hour more out of his car with one carbureter than with another, and with this being the case it is, from a selling point of view, as imperative to fit the best carbureter as it is to have the most acceptel valve timing. Many makers have apparently overlooked the possibilities of increasing efficiency by improving carburation. Improvements in carbureters do not necessarily mean reduction in fuel consumption, but carry with them greater freedom from motor heating and pounding, after the absence of the carbureter knock, etc.

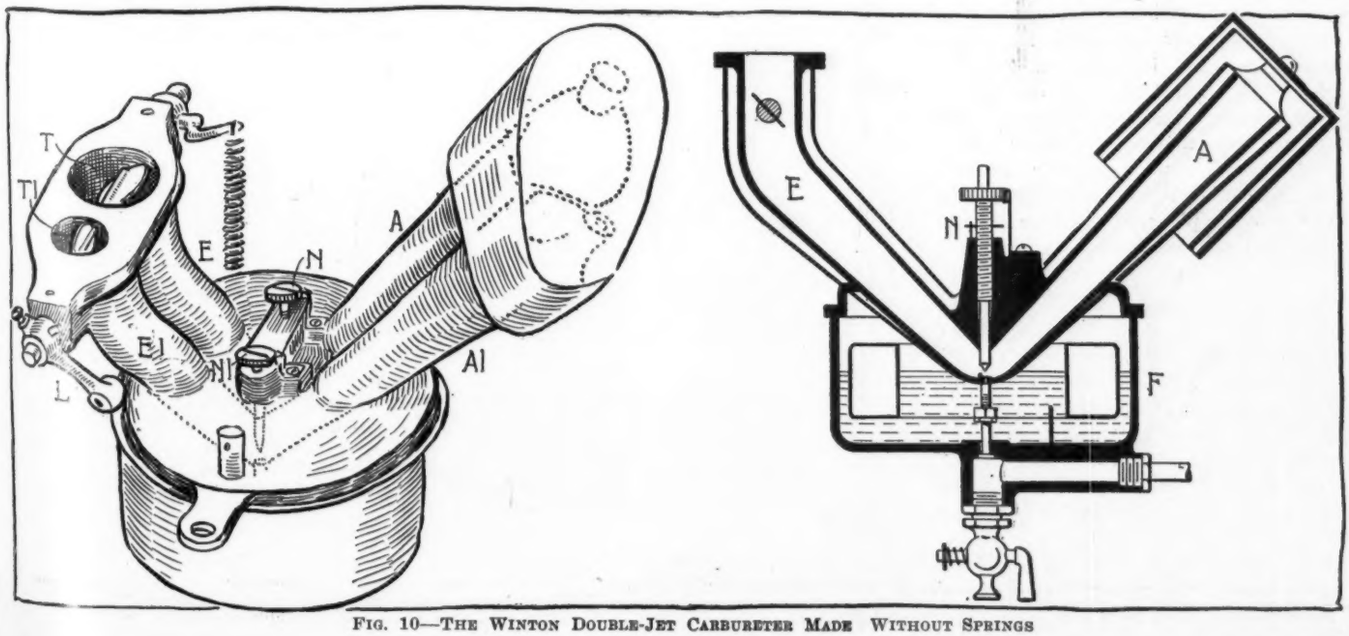


FIG. 10—THE WINTON DOUBLE-JET CARBURETER MADE WITHOUT SPRINGS

Latest Tendencies in Motor Buggies

ALTHOUGH Chicago, historically considered, is the home of the motor buggy, the Coliseum show will have to share the glory this year with the exposition at the Grand Central palace, New York, in which a goodly exhibit of motor buggies was given. Although the high-wheeled motor vehicle had its inception in Chicago, its manufacture has in no wise been restricted to the limits of the city, but the expansion has been such that now vehicles of this type are manufactured in at least half a dozen of the central states. The original picturesqueness of the vehicle as compared with the low-wheel type has been retained by several of the earliest builders, the 44 and 48-inch road wheels not having been superseded by the 36 or 40-inch sizes. In cases where several newcomers in the field have reduced the wheel diameter to 36 inches and in some cases even less, it is doubtful if the name motor buggy still holds good, if the term is based solely on the size of the wheels, or on the use of certain constructions together with solid rubber tires. There are cases on record where small runabouts equipped with solid rubber tires of 32-inch sizes have been designated motor buggies, the only reason for their being so named being the body style.

The problem in motor buggies as to whether chain or cable drive is the better is not being settled very quickly, several of the new makers have fitted chain-drive, whereas not a few of the pioneers remain with the cable method of propulsion. There has within the last year come a considerable trend toward increasing power in the motor buggy, and now the four-cylinder type is in use by several makers. One of the most ingenious in this respect is the Holsman with four air-cooled horizontal cylinders arranged in pairs on opposite sides of the crankshaft with one piston serving for two cylinders. Although early preference was entirely for the air-cooled motor of small size, preferably 4 by 4 inches, there has been considerable digression from those pioneering days, and now water-cooled cars are fairly frequent.

Perhaps no part of the motor buggy has greater versatility apparent than in the transmission and drive system. With this part of the car, it was a case of "necessity is the mother of invention." In the early days of motor buggies, it was possible to buy air-cooled motors well suited for the purpose, but the purchase of a transmission system for a car of this type was out of the question, in that parts makers had not even thought of the condition in many cases. The result of this dearth of transmission parts is today exemplified

Specifications of Car

PLEASU

MAKE AND MODEL		Price	Horsepower A. L. A. M.	BODY Type	Seats	MOTOR Cylinders	Bore	Stroke	COOLING Radiator	IGNITION Magneto	Battery
Am. Locomotive		$6000	54	Optional	7	6	4¾	5½	Honeycomb	L. T. Bosch	Make & Br
Am. Locomotive		5000	36	Optional	2-7	4	4¾	5½	Honeycomb	L. T. Bosch	Make & Br
Am. Locomotive		4000	25	Optional	2-5	4	3 15-16	4¾	Honeycomb	L. T. Bosch	Make & Br
Am. Locomotive		3350	25	Taxicab	7	4	3 15-16	4¾	Honeycomb	L. T. Bosch	Make & Br
Auburn	B	1400	26	Touring Car	5	4	4	4	Honeycomb	Bosch Extra	Storage
Auburn	C	1350	26	Dbl. Roadster	4	4	4	4	Honeycomb	Bosch Extra	Storage
Auburn	D	1300	26	Sgl. Roadster	3	4	4	4	Honeycomb	Bosch Extra	Storage
Auburn	G	1250	22	Touring Car	5	2	5¼	5	Cellular		Stor.& Dry
Auburn	K	1150	22	Roadster	3	2	5¼	5	Cellular		Stor.& Dry
Aurora		1100	16	Touring Car	4	2	4½	5	Vert. Tube		Storage
Aurora		800	16	Runabout	3	2	4½	5	Vert. Tube		Storage
Buick	10	1000	22	Runabout	3	4	3¾	3¾	Tubular	Bosch H. T.	Dry Cells
Buick	F. & G.	1250	16	Optional	3-5	2	4½	5	Tubular		Stor.& Dry
Buick	16 & 17	1750	32	Optional	4-5	4	4½	5	Tubular	Bosch H. T.	Dry Cells
Buick	6 & 7	2750	40	Optional	2-5	4	5	5	Tubular	Bosch H. T.	Dry Cells
Bendix	9-L	1500	25	Roadster	3-4	4	4	4	Tubular	High Tension	Dry Cells
Berliet	Chassis	4000	17	Optional	2-7	4	3¼	4¾	Honeycomb	Bosch	
Berliet	Chassis	4500	25	Optional	2-7	4	4	4¾	Honeycomb	Bosch	
Berliet	Chassis	5500	36	Optional	2-7	4	4¾	5½	Honeycomb	Bosch	
Berliet	Chassis	6500	38	Optional	2-7	6	4	5½	Honeycomb	Bosch	
Cameron	14	900	24	Runabout	2	4	3⅞	3½	Air Cooled	Remy	Dry Cells
Cameron	14	950	24	Roadster	3	4	3⅞	3½	Air Cooled	Remy	Dry Cells
Cameron	15	1000	24	Runabout	2	4	3⅞	3½	Air Cooled	Remy	Dry Cells
Cameron	16	1100	24	Touring Car	5	4	3⅞	3½	Air Cooled	Remy	Dry Cells
Cameron	16	1050	24	Roadster	4	4	3⅞	3½	Air Cooled	Remy	Dry Cells
Cameron	11	1500	36	Optional	...	6	3⅞	3¾	Air Cooled	Remy	Dry Cells
Dorris		2500	29	Optional	2-5	4	4¼	5	Vert. Tube	Extra Equipment	At. Kent S
Dorris		3600	29	Limousine	6	4	4¼	5	Vert. Tube	Extra Equipment	
Great Western	18	1350	20	Detach. Ton	5	2	5	7	Vert. Tube	Remy	Dry Cells
Great Western	20-A	1600	26	Runabout	2-3	4	4	5	Vert. Tube	Remy	Dry Cells
Great Western	20	1600	26	Detach Ton	5	4	4	5	Vert. Tube	Remy	Dry Cells
Great Western	21	2500	32	Detach Ton	5	4	4½	5½	Vert. Tube	Remy	Storage
Great Western	22	4000	40	Touring	7	4	5	6	Vert. Tube	Remy	Storage
Glide	G	2500	36	Touring	5-7	4	4⅜	5	Cellular	Bosch High Ten.	Storage
Glide	R	2000	36	Roadster	2-4	4	4⅜	5	Cellular	Bosch High Ten.	Storage
Halladay	D	2500	34	Touring	7-7	4	4⅝	5	Vert. Tube	Bosch High Ten.	Storage
Halladay	E	1050	22	Roadster	2-3	4	3¾	4½	Vert. Tube	Bosch High Ten.	Storage
Halladay	F	1100	22	Surrey	4	4	3¾	4½	Vert. Tube	Bosch High Ten.	Storage
Halladay	G	1200	22	Touring	4	4	3¾	4½	Vert. Tube	Bosch High Ten.	Storage
Meteor	F	3750	40	Touring	7	4	5	5½	Vert. Tube	Bosch High Ten.	Storage
Meteor	F-1	3750	40	Baby Ton	4	4	5	5½	Vert. Tube	Bosch High Ten.	Storage
Oldsmobile	D	2750	36	Touring	5	4	4¾	4¾	Cellular		Storage & B
Oldsmobile	D	2750	36	Toy Ton	4	4	4¾	4¾	Cellular		Storage & B
Oldsmobile	D	3800	36	Limousine	5	4	4¾	4¾	Cellular		Storage & B
Oldsmobile	Dr.	2750	36	Runabout	2-4	4	4¾	4¾	Cellular		Storage & B
Oldsmobile	Dr.	2750	36	Detach. Ton	4	4	4¾	4¾	Cellular		Storage & B
Oldsmobile	Z	4500	54	Touring	7	6	4¾	4¾	Cellular	Bosch High Ten.	Storage
Oldsmobile	Z	5800	54	Limousine	6-7	6	4¾	4¾	Cellular	Bosch High Ten.	Storage
Oldsmobile	Z	6000	54	Landaulet	6-7	6	4¾	4¾	Cellular	Bosch High Ten.	Storage
Pittsburg Six	B	3000	54	Runabout	3	6	4¾	5¼	Honeycomb	Bosch High Ten.	Storage
Pittsburg Six	C	3200	54	Roadster	4	6	4¾	5¼	Honeycomb	Bosch High Ten.	Storage
Pittsburg Six	D	3500	54	Touring	7	6	4¾	5¼	Honeycomb	Bosch High Ten.	Storage
Rambler	47	1150	20	Roadster	2	5	5	6	Flat Tube		Storage
Rambler	41	1350	20	Touring	5	5	5	6	Flat Tube		Storage
Rambler	34-A	2000	32	Roadster	3-4	4	4½	4½	Flat Tube	Bosch Extra Eq't	Storage
Rambler	44	2250	32	Optional	4-5	4	4½	4½	Flat Tube	Bosch Extra Eq't	Storage
Rambler	45	2500	40	Optional	4-7	4	5	5½	Flat Tube	Bosch Extra Eq't	Storage
Rider-Lewis	X	2500	38	Tonneauette	4	6	4	4	Honeycomb	Bosch	
Rider-Lewis	IX	2500	38	Roadster	2-3	6	4	4	Honeycomb	Bosch	
Rider-Lewis	VIII	2500	38	Touring	5-7	6	4	4	Honeycomb	Bosch	
Ricketts		.....	31	.....	...	6	3⅝	4	.....	Splitdorf	Storage
Owen Thomas		2800	49	Dbl. Roadster	5	6	4½	4	Air Cooled	Generator	Storage
Owen Thomas		3000	49	Touring	7	6	4½	4	Air Cooled	Generator	Storage
Richmond	J-2	1050	22	Surrey	4	4	3¾	4	Air Cooled		Dry & Stor
Richmond	J-1	900	22	Roadster	3	4	3¾	4	Air Cooled		Dry & Stor
Richmond	J-3	1150	25	Tonneau	4-5	4	4	4	Air Cooled		Dry & Stor

MOT

Bendix	4	1400	26	Roadster	2	4	4	4	Tubular	Splitdorf	
Bendix	9-H	1500	26	Roadster	2-4	4	4	4	Tubular	Splitdorf	Dry Cells
Clark-Hatfield	23	650	14	Buggy	2	2	4¼	4	Air Cooled		Storage
Duer		750	13	Buggy	2	2	4	4	Air Cooled		Storage
Mier	A	575	13	Runabout	2	2	4	4	Tubular		Battery
Mier	C	650	16	Runabout	2	2	4½	5	Tubular		Battery
Mier	D	750	16	Surrey	4	2	4½	5	Tubular		Battery
Staver	20	975	22	Roadster	2-3	4	3⅝	4½	Honeycomb	Magneto Extra	Storage
Zimmerman	G	650	14	Buggy	2	2	4¼	4	Air Cooled		Dry Cells
Zimmerman	H	650	16	Runabout	2	2	4½	4	Air Cooled		Dry Cells
Zimmerman	I	750	18	Surrey	4	2	4¾	4	Air Cooled		Dry Cells
Zimmerman	K	735	18	Roadster	2-3	2	4¾	4	Air Cooled		Dry Cells

COMMERC

Am. Locomotive		3500	25	Express	...	4	3 15-16	4¾	Honeycomb	Bosch Low Ten.	Make & Br
Aurora	Del'y Wagon	1000	20	Del'v'y Wagon	...	2	5	5	Vert. Tube		Dry Cells
Duer		750	16	Del'v'y Wagon	...	2	4½	4	Air Cooled		Dry Cells
Randolph	B	1500	22	Optional	...	2	5¼	4½	Cellular		Storage
Randolph	C	2000	22	Optional	...	2	5¼	4½	Cellular		Storage
Randolph	D	2500	32	Optional 2 Ton	...	4	4½	5¼	Cellular	High Tension	
Randolph	E	3250	36	Optional 3 Ton	...	4	4¾	5½	Cellular	High Tension	
Randolph	F	3750	40	Optional 4 Ton	...	4	5	5¾	Cellular	High Tension	

Shown Only at Chicago

MOTOR CARS

Lubrication	Clutch	TRANSMISSION Type	Speeds	Drive	Brakes	Wheel Base	Frame	TIRES Front	Rear
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	4	Side Chain	4	134	Pressed Steel	36.02x4.13	36.22x4.72
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	4	Side Chain	4	126	Pressed Steel	36.02x4.13	36.22x4.72
Gravity Oiler	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	112	Pressed Steel	34.35x3.54	34.64x4.72
Gravity Oiler	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	103	Pressed Steel	32x4	32x4
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	106	Pressed Steel	32x3½	32x3½
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	106	Pressed Steel	32x3½	32x3½
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	106	Pressed Steel	32x3½	32x3½
Force Feed	Cone	Planetary	2	Chain	2	100	Pressed Steel	32x3½	32x3½
Force Feed	Cone	Planetary	2	Chain	2	100	Pressed Steel	32x3½	32x3½
Force Feed		Planetary	2	Shaft	2	88	Pressed Steel	32x3	32x3½
Force Feed		Planetary	2	Shaft	2	88	Pressed Steel	32x3	32x3½
Splash Oiler	Cone	Planetary	2	Shaft	3	91	Pressed Steel	30x3½	30x3½
Mech. Force Feed	Cone	Planetary	2	Chain	2	92	Angle Iron	30x4	30x4
Splash Self Cont'd	Cone	Sel. Slid'g Gear	3	Shaft	3	112	Pressed Steel	32x4	32x4
Splash Self Cont'd	Cone	Sel. Slid'g Gear	3	Shaft	4	122	Pressed Steel	32x4	32x4
Splash Self Cont'd	Mult. Disk	Sel. Slid'g Gear	3	Side Chain	3	105	Pressed Steel	36x3	36x3
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	4	Shaft	4	117	Pressed Steel	31.89x3.54	32.08x4.52
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	4	Shaft	4	117	Pressed Steel	34.25x3.54	36.22x4.72
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	4	Chains	4	118	Pressed Steel	34.25x3.54	36.22x4.72
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	4	Chains	4	126	Pressed Steel	34.25x3.54	36.22x4.72
Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	96	Pressed Steel	30x3	30x3
Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	96	Pressed Steel	30x3	30x3
Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	96	Pressed Steel	32x3	32x3
Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	104	Pressed Steel	30x3½	30x3½
Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	104	Pressed Steel	30x3½	30x3½
Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	114	Pressed Steel	34x3½	34x3½
Mech. Oiler	Mult. Disk	Sel. Slid'g Gear	3	Shaft	3	108	Pressed Steel	34x4	34x4
Mech. Oiler	Mult. Disk	Sel. Slid'g Gear	3	Shaft	3	108	Pressed Steel	34x4	34x4
Mech. Oiler	Mult. Disk	Planetary	2	Chain	2	100	Pressed Steel	32x3½	32x3½
Mech. Oiler	Cone	Sel. Slid'g Gear	3	Shaft	4	107	Pressed Steel	32x3½	32x3½
Mech. Oiler	Cone	Sel. Slid'g Gear	3	Shaft	4	107	Pressed Steel	32x3½	32x3½
Mech. Oiler	Cone	Sel. Slid'g Gear	3	Shaft	4	114	Pressed Steel	34x4	34x4
Mech. Oiler	Cone	Sel. Slid'g Gear	3	Shaft	4	122	Pressed Steel	34x4	34x4½
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	120	Pressed Steel	34x4½	34x4½
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	106	Pressed Steel	36x4	36x4
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	3	118	Pressed Steel	34x4	34x4
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	2	100	Pressed Steel	32x3½	32x3½
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	2	100	Pressed Steel	32x3½	32x3½
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft	2	100	Pressed Steel	32x3½	32x3½
Mech. Oiler	Cork Ins't Disk	Sel. Slid'g Gear	3	Shaft	4	120	Pressed Steel	36x4	36x4½
Mech. Oiler	Cork Ins't Disk	Sel. Slid'g Gear	3	Shaft	4	120	Pressed Steel	36x4	36x4½
Crank Case Pump	Cone	Sel. Slid'g Gear	3	Shaft	4	112	Pressed Steel	34x3½	34x4
Crank Case Pump	Cone	Sel. Slid'g Gear	3	Shaft	4	112	Pressed Steel	34x3½	34x4
Crank Case Pump	Cone	Sel. Slid'g Gear	3	Shaft	4	112	Pressed Steel	34x3½	34x4
Crank Case Pump	Cone	Sel. Slid'g Gear	3	Shaft	4	112	Pressed Steel	34x3½	34x4
Crank Case Pump	Cone	Sel. Slid'g Gear	3	Shaft	4	112	Pressed Steel	34x3½	34x4
Crank Case Pump	Cone	Sel. Slid'g Gear	3	Shaft	4	130	Pressed Steel	36x4½	36x5
Crank Case Pump	Cone	Sel. Slid'g Gear	3	Shaft	4	130	Pressed Steel	36x4½	36x5
Crank Case Pump	Cone	Sel. Slid'n Gear	3	Shaft	4	130	Pressed Steel	36x4½	36x5
Splash Aux Res.	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	121	Pressed Steel	34x3½	34x4
Splash Aux Res.	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	121	Pressed Steel	34x4	34x4
Splash Aux Res.	Mult. Disk	Sel. Slid'g Gear	3	Shaft	4	124	Pressed Steel	34x4	34x4½
Mech. Force Feed	Mult. Disk	Planetary	2	Chain	3	102	Pressed Steel	30x3½	30x3½
Mech. Force Feed	Mult. Disk	Planetary	2	Chain	3	106	Pressed Steel	34x4	34x4
Mech. Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	110	Pressed Steel	36x4	36x4
Mech. Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	110	Pressed Steel	36x4	36x4
Mech. Force Feed	Cone	Sel. Slid'g Gear	3	Shaft	4	123	Pressed Steel	36x4½	36x4½
Mech. Force Feed	Modified Cone	Sel.Sl.Gr.R.Ax.	3	Shaft	4	122	Pressed Steel	34x4	24x4
Mech. Force Feed	Modified Cone	Sel.Sl.Gr.R.Ax.	3	Shaft	4	122	Pressed Steel	34x3½	24x3½
Mech. Force Feed	Modified Cone	Sel.Sl.Gr.R.Ax.	3	Shaft	4	122	Pressed Steel	34x4	34x4
Crank Case Pump	Mult. Disk	Sel. Slid'g Gear	3	Shaft		116	Pressed Steel	32x3½	32x3½
Crank Case Pump	Expand'g Ring	Sel. Slid'g Gear	3	Shaft	4	136	Pressed Steel	36x4	36x4
Crank Case Pump	Expand'g Ring	Sel. Slid'g Gear	3	Shaft	4	136	Pressed Steel	36x4	36x4
Splash Grav. Oil'r	Cone	Sel. Slid'g Gear	2	Shaft	4	96	Wood Arm'd Steel	30x3½	30x3½
Splash Grav. Oil'r	Cone	Sel. Slid'g Gear	2	Shaft	4	88	Wood Arm'd Steel	30x3	30x3
Splash Grav. Oil'r	Cone	Sel. Slid'g Gear	2	Shaft	4	102	Wood Arm'd Steel	30x3½	30x3½

BUGGIES

Self Contained	Twin Friction	Twin Friction		Side Chains	3	96	Pressed Steel	Solid 2	2
Self Contained	Mult. Disk	Sel. Slid'g Gear		Side Chains	3	105	Pressed Steel	Solid41x3	41x3
Splash Force Feed		Friction		Sgl. Chain	4	76	Pressed Steel	39x1½	39x1½
Force Feed		Gears in Mesh	2	FrictionCable	2	72	Steel Arm'd Wood	44x1¼	48x1¼
Mech. Oiler		Friction		Side Chain	2	86	Angle Iron	30	32
Pressure Feed		Friction		Side Chain			Pressed Steel	30	32
Mech. Self Cont'd	Mult. Disk	Friction		Side Chain			Pressed Steel	30	32
Mech. Oiler		Slid'g Gear	2	Shaft	2	92	Pressed Steel	Solid38x2	38x2
Mech. Oiler		Dbl. Disk Fric.		Dbl. Chain	2	80	Angle Steel	37x1½	37x1½
Mech. Oiler		Planetary	2	Side Chains	2	80	Angle Steel	37x1½	37x1½
Mech. Oiler		Planetary	2	Side Chains	2	95	Angle Steel	37x1¾	37x1¾
Mech. Oiler		Planetary	2	Side Chains	2	95	Angle Steel	37x1¾	37x1¾

POWER WAGONS

Grav. Oiler Splash	Mult. Disk	Sel. Slid'g Gear	3	Side Chains		110	Angle Iron	36x5	36x3½ Dual
Mech. Force Feed		Planetary	2	Shaft	2	88	Pressed Steel	32x3	32x3½
Mech. Force Feed		Gears in Mesh	2	FrictionCable	2	100	Steel Arm'd Wood	44x1½	48x1½
Mech. Force Feed		Friction	3	Side Chains	3	80	Pressed Steel	34x2½	36x3
Mech. Force Feed		Friction	3	Side Chains	3	95	Pressed Steel	34x3	36x3½
Mech. Force Feed	Cone, Cork Ins.	Select	4	Side Chains	3	100	Rolled Steel	36x4	38x5
Mech. Force Feed	Cone, Cork Ins.	Select	4	Side Chains	3	120	Rolled Steel	36x5	36x3½ Dual
Mech. Force Feed	Cone, Cork Ins.	Select	4	Side Chains	3	124	Rolled Steel	36x6	36x4 Dual

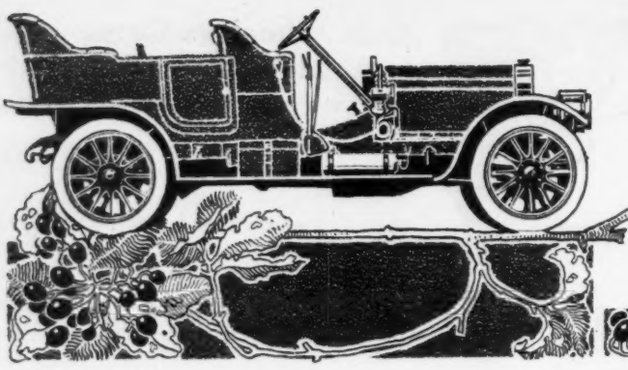
High Wheelers Come Into Show Limelight

on every hand by the versatility of speed changes and drive. One car eliminates the transmission entirely and uses cables for drive; another has a bevel gear transmission giving two direct speeds; a third is fitted with a planetary gearset; and now come some with a selective gearset. It would appear that many of the motor buggy makers would prefer following the lines of big car construction, contenting themselves with solid rubber types and different body styles. In the transmission system friction has received not a little attention, and in two cases the friction set is placed in front of the motor, the latter being hung as accessibly as possible over the rear axle.

Motor buggies afford a good study in car body economy in that the motor is invariably housed beneath some part of the body, except in a few of the larger types where it has been located under the forward bonnet, which is generally the case where the cylinders are mounted transversely in front. With the amidship location and the transverse rear position also, there is practically no loss of space, which is largely responsible for the short wheelbase of this year's motor buggies, which averages but 71 inches.

Before dismissing the subject of the motors, it might be argued that the trend of motor buggies toward four-cylinder construction is not in keeping with the great demand for this class of machine. The purchaser of one of these vehicles is looking for a simple and fool-proof creation as it is possible to obtain, and it would seem that the multiplication of cylinders with increase or likelihood of ignition troubles. As opposed to this are the claims of the four-cylinder enthusiast that vibration is reduced by the multiplication of cylinders, and as this is an important factor in the motor buggy problem it is one deserving of the fullest consideration.

In the general construction of motor buggies, the most important improvements have been taking place in the last 12 months. The devoting of more attention to the finish of the machines, the improved workmanship, and those alterations in design consequent upon a year of research have all done their part not only to popularize but increase the merit of the motor buggy. The demand which originally was confined to small western and central states has of late spread to the populous towns and smaller cities of the middle areas, and even the motor buggy has a big following in many metropolitan centers. The reduction in the wheel diameter has had a salutory effect in certain classes.

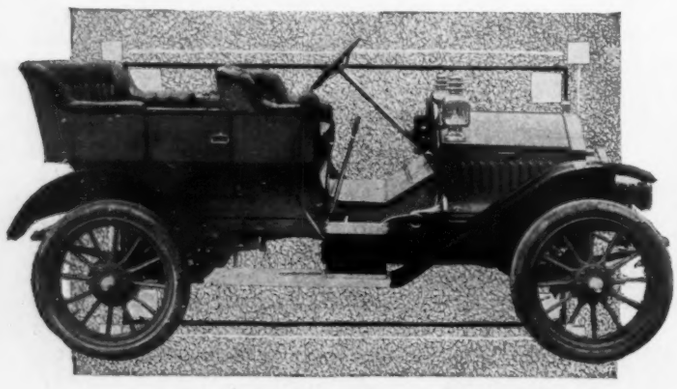


Motor Car

A REVIEW of the cars to be exhibited at the Chicago show would not be complete without a few deductions arrived from a leisurely and comprehensive survey of the cars exhibited at the Grand Central palace and Madison Square garden shows, New York. It is of interest to note a few of the tendencies in car construction that come to the surface after a close scrutiny. At the palace show, of the eleven makes of cars listed at less than $1,000, the average cylinder diameter is 4.3 inches, the stroke 4.17 inches and the wheelbases 88.4 inches. These figures show that in the small car field, at least, the long stroke motor is not receiving very much attention. In fact, the average cylinder diameter exceeds the stroke by practically ⅛ inch.

In the class of cars selling at $1,000 to $1,500, the cylinder diameter averaged 4.3 inches for the thirteen sizes of motors exhibited, and the stroke 4.6, so that the long stroke in this department was a leader by an average of .3 inch. The wheelbases on these cars average 103 inches. Coming to the division of cars selling from $1,500 to $2,000, of which there were sixteen represented, the cylinder bore, or diameter, averaged 4.38 inches and the stroke 4.69, with a wheelbase of 110.2. These figures show the stroke to approximately 3/10 of an inch in excess of the bore. The struggle between bore and stroke in cars selling from $2,000 to $3,000 proves to be closer, the stroke having but an average of 1/10-inch advantage in the nine makes of cars in this division. The averages were: Diameter 4.6 inches, stroke 4.7. In this division the wheelbase averaged 114.5. Passing on to the Grand Central palace cars retailing at from $3,000 to $5,000, the struggle between bore and stroke remained practically the same, the ten representatives of this class having an average cylinder diameter of 4.9, and a stroke of 5.2, showing the stroke to exceed the bore by 3/10-inch. The wheelbase of these cars average 118.9 inches. In a recapitulation the following results appear:

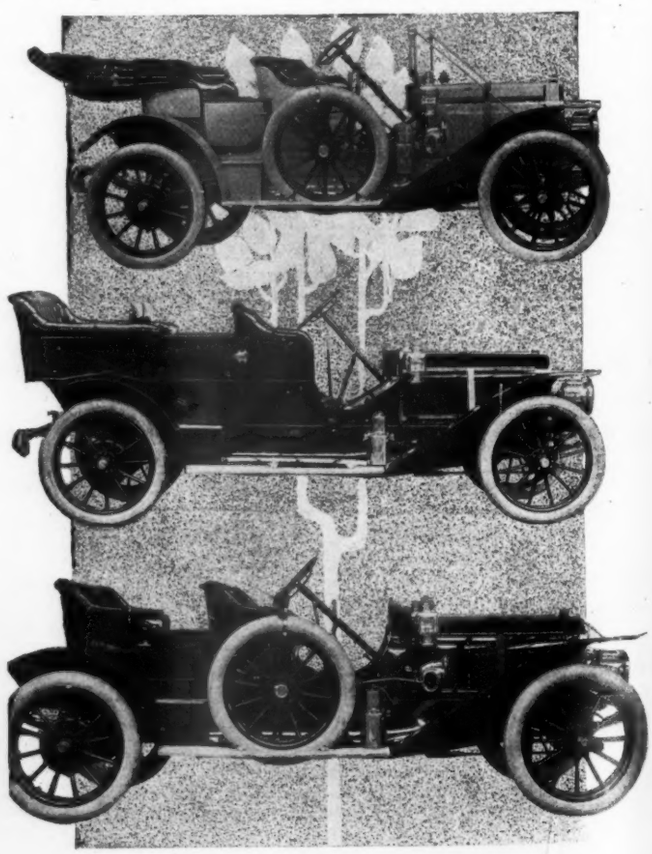
Class	Bore	Stroke	Wheelbase
Motor buggies	4.3	4.3	71
Under $1,000	4.3	4.17	88.4
$1,000 to $1,500	4.3	4.61	103
1,500 to 2,000	4.38	4.69	106.2
2,000 to 3,000	4.6	4.7	114.5
3,000 to 5,000	4.9	5.2	118.9



ONE OF THE OLDSMOBILE LINE, MODEL 20

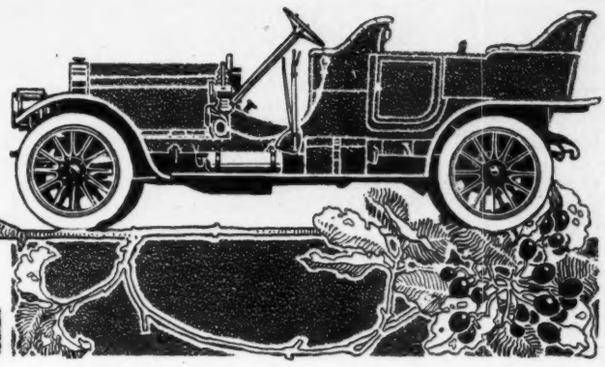
Coming next to the Madison Square garden show, in which a division of bore and stroke as well as wheelbase according to a price division has not been attempted, the averages for forty-four different car models with different motor sizes is as follows: Diameter, 4.68 inches; stroke, 4.9 inches; wheelbase, 118.7 inches. This average of bore and stroke shows the remarkable coincident that the stroke exceeds the bore by practically 3/10 inch, a figure very conspicuous in all the classes of cars in the Grand Central palace exhibition with the exception of those selling under $1,000 and those in the motor buggy division. From these averages of both shows, which will not be seriously affected by the averages on the Chicago show of next week, it is a safe assertion to make that for all cars above $1,000 the stroke averages one-third in excess of the diameter; that for all cars less than $1,000, the diameter exceeds the stroke by ⅛-inch, and for motor buggies the square cylinder rules, the average bore and stroke being 4.3.

In the following car descriptions of machines not exhibited at either of the New York shows, the great tendencies exhibited by the cars at the New York exhibitions are noted in these. Chicago, the home of the motor buggy, will offer a good exposi-



RAMBLER, MODEL 44
RAMBLER SEVEN-PASSENGER TOURING CAR
RAMBLER CLOSE-COUPLED BODY

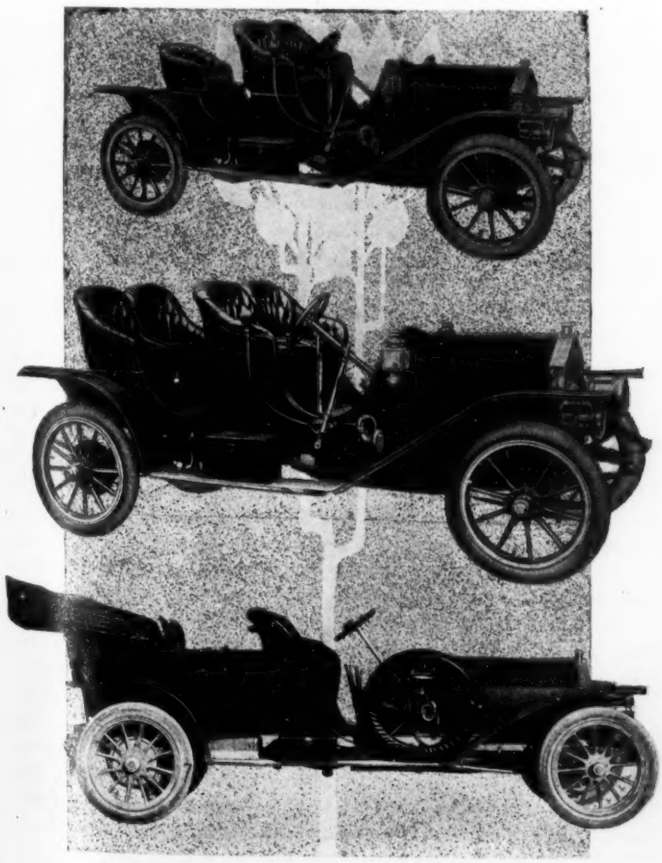
Department



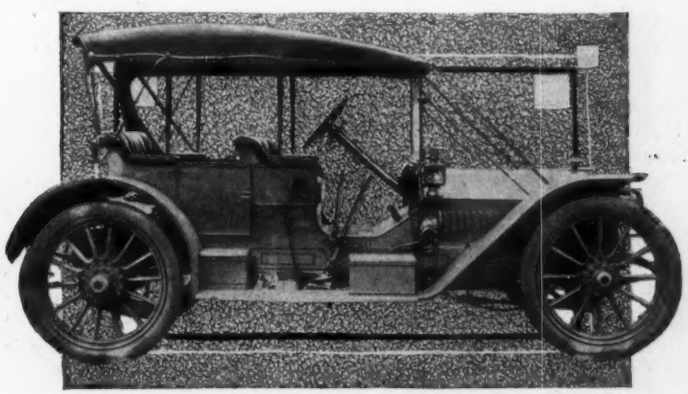
tion of this style of vehicle. There is a noticeable tendency in the motor buggy class to reduce the wheel diameter from 44 and 48 inches to the 36-inch figure, and one or two makers are giving options on solid or pneumatic tires. Also new in the motor buggy line is the marketing of the four-cylinder buggy, equipped with a selective or progressive gearset and fitted with 36 or 38-inch wheels shod with either solid or pneumatic tires. The diversity in the construction of the motor buggy field continues, the problem of cable or chain-drive not being much more solved than a year ago. Air-cooling is particularly popular in all motor buggy lines, and friction transmission has received considerable attention.

Within the last year several new factories have started operations in the middle west, and their cars will be shown for the first time. Considerable originality appears in some of these machines. Several of them are of the six-cylinder variety with separately cast cylinders. One, the Owen Thomas, is particularly radical, having eliminated the carbureter and used the injection system of the gasoline. This car also incorporates the lower part of the body and the frame as a unit, and includes in its make-up many other interesting details. The new models show a desire for the valves-in-the-head type of motor with overhead camshaft in one or two cases. It is natural to expect that in several new models stock transmission in rear axles are in some cases used, although the intentions of the makers are to discontinue such as soon as their own designs are perfected.

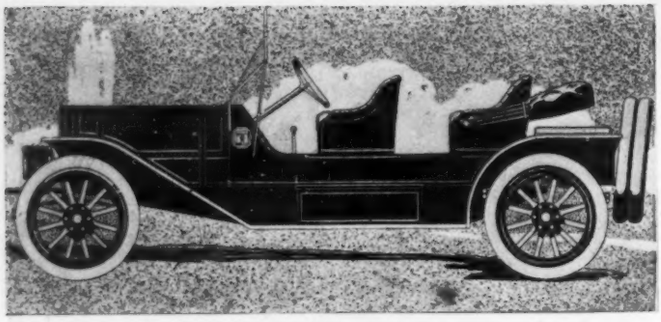
Oldsmobile—The Oldsmobile line for 1909 will consist of eight models built on four different chassis, Models D, toy tonneau and touring car, and DR, flying roadster and detachable toy tonneau are built on a chassis with 112-inch wheelbase, 34-inch wheels, equipped with 3½-inch and 4-inch tires, full elliptic rear springs, and a four-cylinder motor rated at 40 horsepower. Model X Special has 106-inch wheelbase, 32-inch wheels, 3½ and 4-inch tires, three-quarter elliptic rear springs and a four-cylinder motor rated at 35 horsepower. Models Z touring car and runabout have a 130-inch wheelbase, 36-inch wheels, equipped with 4½ and 5-inch tires, full elliptic rear springs and a six-cylinder motor rated at 60 horsepower. Model 20, the lowest priced car of the line, has a 91-inch wheelbase, 30-inch wheels with 3½-inch tires, full elliptic rear springs and a 22 horsepower motor of the four-cylinder type. Many new and interesting changes and improvements are to be seen in the Oldsmobile product this year; on D and DR models a cellular radiator, supported on two trunnions on top of the frame at either side, will tend to eliminate all trouble from that source; a new centrifugal water pump driven off the same shaft with the magneto from one gear enclosed with the timing gears, has been fitted; the timing gears are all of wider construction and made of steel; the fan bracket is cast integral with the timing gearcase; a new type of adjustable push rods is used entirely enclosed with valve springs in a dust-proof case; the water circulation has been changed so that the water upon leaving the pump flows in opposite directions to each pair of cylinders; the exhaust piping also has been changed so that the exhaust from each pair of cylinders is led in opposite directions by two sections of pipe which curve down at either end of the motor to join the main exhaust pipe below; a simple and effective plug and socket contact is used on the spark plugs; a gravity feed from the gasoline tank is used in connection with auxiliary pressure from the exhaust pipe and hand pump; a new



Great Western Runabout Type
Great Western as Four-Passenger Roadster
Model Y of the Stevens-Duryea Family



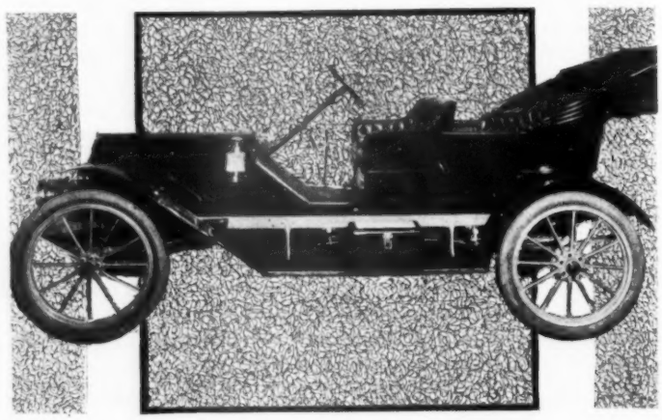
Another of the Oldsmobiles, Model ZR



OWEN THOMAS SIX-CYLINDER MODEL

improved shifting device is used on the clutch; the speed changes are arranged just opposite to those of last year, the reverse being in the forward recess of the inner quadrant with the first speed forward in the rear recess; a new and more compact transmission is used in which gears are rendered noiseless on all speeds; the pedals are broader and flexible, the foot throttle is of a new design which may be operated without removing the foot from its normal position on the foot board; a larger steering wheel is used; the design of the fenders has been improved, mudguards are fitted between the fenders, running boards and the frame and the rear lamp bracket is attached to the rear left fender; grease cups are prominent and Gabriel shock absorbers are part of the regular equipment. The general characteristics of Oldsmobile construction may be seen from the following specifications of the model D chassis. Cylinders are cast in pairs with integral heads, waterjackets and valve chambers. The crankshaft is supported in the upper half of the aluminum crankcase in Parson's white brass bearings. Lubrication is by means of the self-contained system; ignition is jump spark with Bosch high-tension magneto and Lacoste type of timer with storage battery and dry cells. An Oldsmobile automatic carbureter is used with gravity or pressure feed from a tank of 18 gallons capacity with a reserve of 4 gallons. A leather-faced cone clutch with springs under the leather and ball thrust bearing is used in connection with a selective type sliding gear transmission, which is equipped with plain or Hess Bright ball bearings at the option of the purchaser. A Timken 1909 semi-floating rear axle, a one-piece drop forged front axle, roller bearing wheels, semi-front and full elliptic rear springs, worm and nut steering gear, with the tie-rod located behind the axle, a drop frame of channel steel with a sub-frame for engine and gearcase, and external and internal brakes on rear wheels are chassis details. The six-cylinder chassis has the same general characteristics except that it is of heavier construction; the annular ball bearing crankshaft is threaded into the rear end of the one-piece crankcase as is the annular ball bearing camshaft, and inspection plates are located at the bottom of the case for the adjustment of connecting rod bearings. Annual ball bearings are used throughout the transmission and running gear, and in the steering gear the rock shaft is carried on two large annular bearings, while the worm is supported at the top by a large ball thrust bearing. The gearcase is a one-piece construction, the gears being assembled through the hand hole plate in the top; and the rear axle is of the full floating type.

Rambler—The major efforts of the Rambler factory for this year will be on four-cylinder cars, but a couple of two-cylinder types are also being marketed. Both of the four-cylinder chassis are alike in general design, but vary in size and constructive strength of parts. They are known respectively as models 44 and 45. Model 44, a 34-horsepower chassis with cylinders 4½ inches square and fitted with five-passenger body, and model 45, a 45-horsepower chassis with 5 by 5½-inch cylinders and seven-passenger body. In addition, however, both chassis are fitted with roadster and toy tonneau body styles and the company is manufacturing closed body types. The Rambler chassis, by which is meant either that employed in model 44 or the model 45, contains several improvements over the 1908 type. In the ignition department the location of the timer at the right front of the motor has been improved by raising it, which has resulted in an increase of accessibility. A novel spark plug terminal is used, in which the high-tension wire to the plug terminates in a fiber handle which hinges to the return water pipe. On the under side of the fiber handle is a metal strip which rests upon the top of the spark plug. With this terminal it is but necessary to raise the fiber block to break a connection. The use of the magneto in conjunction with the batteries results in a complete dual system. The Rambler roller contact timer is used in which the wires remain stationary during any advance or retard of the spark. A change in the lubrication system is that now the oiler is mounted lengthwise underneath the footboard at the left side and further to the rear than last year. In its new location its accessibility is increased and the capacity has been increased 50 per cent. The oiler is placed in a tray which takes care of any slop-over, and the use of an oil guard over the flywheel prevents any unnecessary throwing of lubricant. The water pump is now

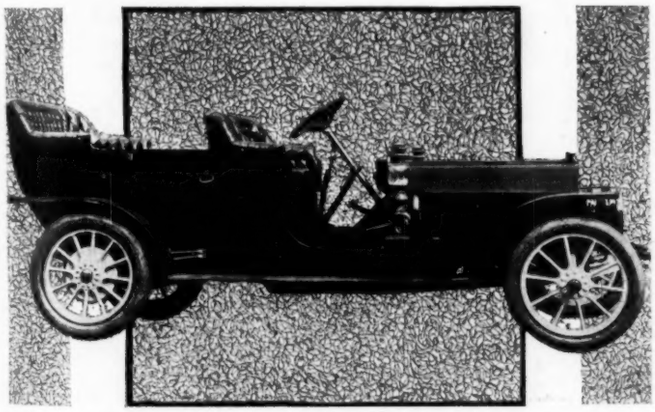


CAMERON SIX-CYLINDER, AN AIR-COOLER

located back of the transverse tubular support at the front end, and in this new location is entirely separate from the half-time gear housing. An important improvement in the selective gearset is that the two shifter rods are carried in a boss in the right side of the case, one being a rod and the other a surrounding sleeve. On the rear end of each is a short arm with a ball ending, with which the shifter mechanism attaches. A change in the clutch is the discontinuance of the balanced type of inverted cone heretofore used and the adoption of a direct-thrust cone type with a friction surface 50 per cent greater than that of last year. The clutch is leather-faced with spiral springs carried in radial slots beneath the leather. The tension of the mainspring can be varied by adjusting three accessibly-located nuts, all of which can be reached with the floorboard raised. Gear-changing is facilitated by the use of a camel's hair block placed in the bearing for releasing the clutch, the friction of the block acting as a brake to stop the spinning of the clutch when disengaged. The clutch is regularly released by a pedal, the throw of which is 50 per cent less than formerly, but it can also be released by the emergency brake lever. The adjustment of this brake lever is such that the clutch can be disengaged without the brake being applied; a further movement of the brake lever will apply the brake. The Rambler gear system consists of the one-piece gearset housing connected by a tube enclosing the driveshaft to the rear axle so that it is a unit with the axle, being supported on a crosspiece of the frame at the front of the gearbox. The large Rambler brakes of last year are continued, having 13-inch drums and 2½-inch bands, but an improvement has been added in a greater possible leverage when applying these brakes. The brake connecting rods are adjusted at the forward end where they are threaded and pass through arms on the brake lever crossshaft. On the front end of the brake rods are large wing nuts, making it possible to adjust them by hand. A tilting steering column is used, which can be locked in any position by a small plate which

clamps on the column and has a serrated face, which meshes with serrations in the aluminum toeboard. This plate is locked in place by a couple of bolts. Triple-action springs are regularly attached. In the two-cylinder Rambler styles a minor improvement is the rear axle, in which a pair of forgings are used to encircle the differential sprocket in place of an aluminum casting used last year. The two-cylinder models are fitted with a tilting body, hinged at the rear and which when raised at the forward end gives ready access to the unit power plant.

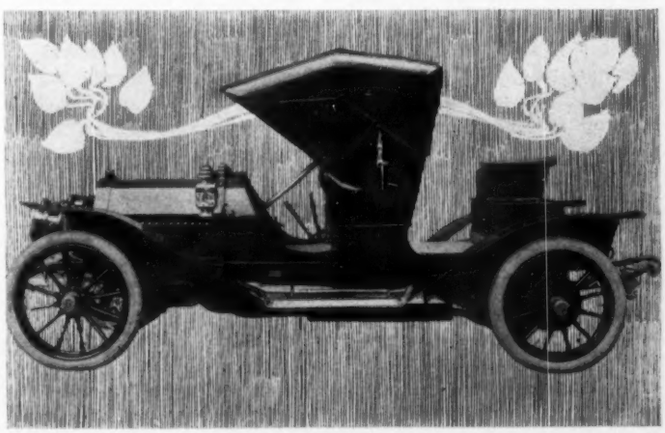
American Locomotive—Four models make up the line of the American Locomotive cars, consisting of two shaft-driven models, a 16-horsepower taxicab, and a 24-horsepower chassis; and two chain-driven chassis with four and six-cylinder motors rated at 40 and 60-horsepower, respectively. All these chassis except that of the taxicab may be equipped with any style body. In all models the motors have vertical cylinders cast in pairs with valves on opposite sides, and are practically of the same mechanical construction throughout, except that in the four-cylinder motors make-and-break ignition is used, the igniter cams being operated by means of pushrods from cams on the exhaust camshafts; and the lubrication is splash with a gravity-feed oiler to maintain the desired level in the crankcase. In the six-cylinder motor the crankcase is divided horizontally into two sections with all crankshaft bearings held between them, and a vertical section at the forward end contains all timing, magneto and water pump gears. The lower portion of the crankcase has an integrally cast sump for the self-contained lubricating system, the bottom of which is formed by a large detachable inspection plate.



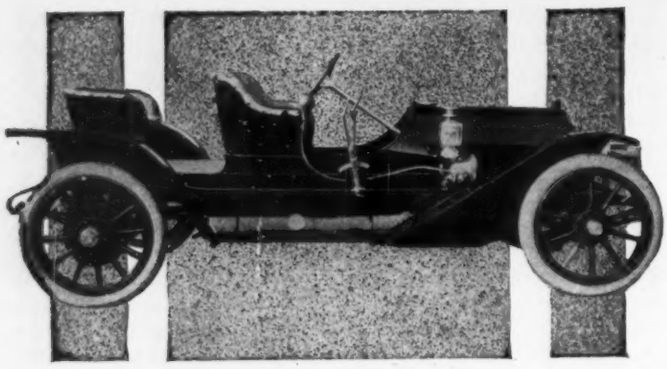
PREMIER IDEA IN SIX-CYLINDER CONSTRUCTION

It is webbed to fill the space between the motor and the frame. Parsons white bronze bearings are used for the crankshaft and connecting rods, and phosphor bronze bushings for the wrist pin bearings. The oil circulation is maintained by a gear pump driven off the exhaust camshaft. Jump spark ignition is used with a high-tension Bosch magneto located on the web of the crankcase on the right side of the motor, just behind the front leg. A honeycomb radiator, a centrifugal pump, and belt-driven fan are features of the cooling system; the water pump being located in the same position as the magneto on the opposite side of the motor. The carbureter is of the float-feed type with an exceedingly large mixing chamber. A very sensitive governor of the ball type is carried on the exhaust camshaft, which operates the valve inside the carbureter, controlling the amount of mixture admitted to the cylinders. Further means of carbureter control are gained through a lever on the steering wheel and a foot accelerator. A multiple-disk clutch is used which runs in oil and is composed of sixty alternating steel and bronze disks, and equipped with a ball-thrust bearing. The transmission is of the selective type, giving four speeds forward with direct drive on third and fourth speeds. The combined transmission and differential case is of cast aluminum, divided horizontally with a large inspection plate on the top, and is supported in front on the side members of the frame by means of two legs cast integral with the lower half, and in the rear at one point to a cross member of the frame, making a three-point suspension. Drive from the jackshaft to the rear axle is by means of heavy Ronold side chains. Hess-Bright ball bearings are used throughout the transmission and running gear. There are four brakes in all; two of which are located on the jackshaft, operated by individual pedals. The two acting upon the rear wheel drums are of the metal-to-metal expanding type, operated by the emergency lever. The frame, of channel steel section with heavy channel steel cross members, is narrowed in front to reduce the turning radius. The axles are of heavy I-beam section drop forgings. In the shaft-driven cars, the running gear is practically the same except that there are only forty-five disks in the clutch, and the differential is removed from the transmission case to the floating rear axle, the housing of which is made from a solid one-piece forging, the side tubes being bored out for the reception of the live axles. A worm-and-sector type steering gear is used.

Great Western—The Great Western line for 1909 includes three chassis with four-cylinder motors, rated at 30, 40 and 50 horsepower, respectively, and one chassis with a two-cylinder motor which is a reproduction of the model 14 of 1908, with a few minor changes, such as longer wheelbase, semi-elliptic springs in front in place of ellipties, and a high-tension magneto, which is now included in the regular equipment. The three models with the four-cylinder motors are practically the same except in length of wheelbases, sizes of tires, and spring suspension, the 50-horsepower car having semi-elliptic springs all around. Elliptic rear springs are used on the small models. The motor is characterized by the valve arrangement, the exhaust valves being located centrally in the top of the cylinder heads, and operated by means of rocker arms and push rods from the camshaft in the crankcase; whereas, the intakes are in the bottom of the valve chambers on the right side of the cylinders, but operated from the same camshaft by means of adjustable lifters. The cylinders are separately cast with integral heads and waterjackets and bolted on to studs which pass right through the crankcase to support the five bronze bearing caps of the crankshaft. The crankcase is of aluminum with a removable lower portion, and has two large inspection plates on either side, held in place by one central yoke for each pair. The crankshaft is heat-treated, ground and offset ½-inch. The water circulation is maintained by a gear-driven pump located at the front of the motor on the left, and the magneto occupies the same position on the opposite side. An adjustable belt-driven fan, attached to the front cylinder, assists in the cooling. Double ignition is used with magneto and battery. Lubrication is by means of a seven-feed mechanical oiler which is ratchet-driven, and located at the rear, on the left side under the exhaust pipe. A cone clutch is used, faced with raybestos, with springs underneath to ease the engagement. Between the



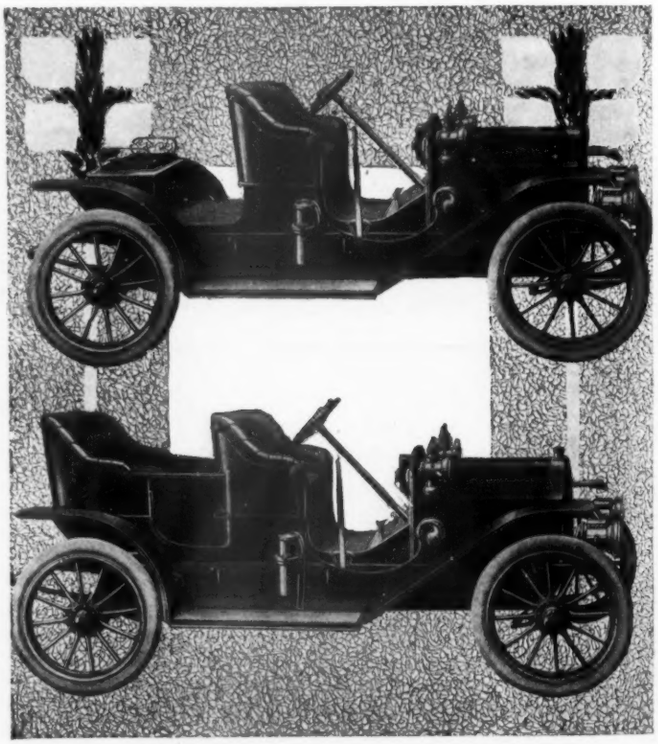
AMERICAN LOCOMOTIVE RUNABOUT WITH TOP



CHALMERS-DETROIT THIRTY AS A RUNABOUT

clutch, which is released through a ball thrust bearing, and the transmission is a double universal joint which allows of the usual sliding for disengagements. A selective gearset, giving three speeds forward, is carried on the same subframe which supports the motor, and Timken roller bearings support both shafts which line in the same vertical plane. A floating type rear axle is used with ball bearings, and the front axle is drop forged of I-beam section with ball bearing spindles. Annular ball bearings are used in the wheels. The steering gear is of the worm and sector type; the pressed steel main frame is narrowed in front to reduce the turning radius; and the brakes are contracting and expanding on rear wheel drums. The two-cylinder car is equipped with an opposed motor located amidships on the left-hand side, bringing the flywheel directly in the middle and the planetary transmission to the right. The drive is by means of a single chain from a sprocket between the flywheel and transmission to the gear on the differential of the rear axle, the shafts of which are enclosed in steel tubes on roller bearings. The frame is of nickel steel channel section, springs are elliptics all around; a worm-and-sector steering gear is used. Ball bearings are fitted in the front axle. The cylinders of the motor are cast individually with integral heads and waterjackets and bolted on to the crankcase. The valves are both in the head and operated by means of rocker arms and push rods from separate camshafts located in the upper part of the crankcase. A force-feed mechanical oiler is used in connection with splash in the crankcase.

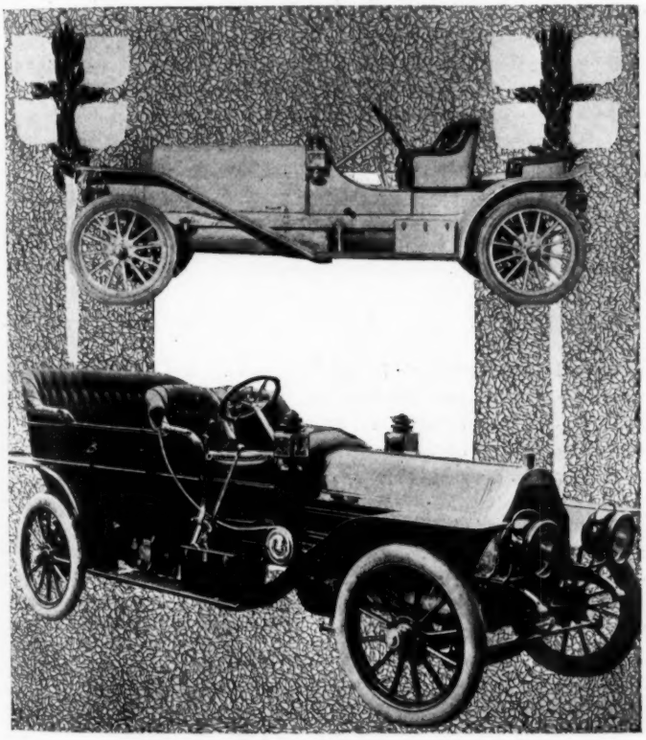
Owen Thomas—The Owen Thomas six, made by the Owen Thomas Co., makes its first appearance in the field of high-class motor car manufacture this year. After 2 years of trying out parts, making jigs, tools, templates and gauges to produce interchangeable parts in quantities, the Owen Thomas company is now offering one type of chassis equipped with either seven-passenger touring, five-passenger roadster or two or three-passenger runabout bodies. The power units are all the same and include all operating levers, pedals, etc., independent of body or frame, the variation in wheelbase affecting only the length of the torsion tube and driveshaft. The engine and transmission form a unit power plant, all working parts of which are encased and run in oil, and supported on three points. By loosening a few nuts, the body with the rear axle and torsion tube can be wheeled back, leaving the power plant on the front axle, and all parts of the engine and transmission very accessible. In a few minutes any part of the engine or transmission can be taken out and replaced. All necessary adjustments to crank bearings or clutch are made by removing a cover plate fastened with four nuts. Imported D. W. F. bearings are used throughout the engine, transmission and running gear. The connecting-rod bearings, which are plain, are exceptionally broad; in fact, all bearings, gears and working parts are of large construction. The motor is of the six-cylinder type, four-cycle with six separately-cast cylinders and is rated at 48 horsepower. No waterjacket or cooling fins are used on these cylinders, which make it possible to machine the walls both inside and out. The walls are therefore of even thickness and can be made thinner than would otherwise be safe. The pistons are ground and fitted with four rings; a large oil groove is turned on a level with the wristpin and smaller one below, to carry the oil from the crank chamber to the cylinder walls and wristpin bearings. The wristpin is a hardened and ground steel tube, with a bearing of large surface in the piston. The connecting-rods are two and one-half times the length of the stroke. This, together with the offset crankshaft, gives a more direct push on the crankpin during the working stroke, preventing undue friction and wear between the pistons and cylinder walls by equalizing the side thrust of the compression and working stroke. The crankshaft is a patented construction, cut from a solid billet of especially hammer-forged oil-tempered Vanadium steel with ground bearing surfaces. Instead of the ordinary crankarms, hollow disks are used between the crankpins; these disks are a little larger in diameter than the outside of the pins. Four of the disks are about 1⅜ inch wide, each fitted with an imported ball bearing, with 9 inches



HALLADAY, MODEL E TYPE RUNABOUT
HALLADAY FITTED WITH TOY TONNEAU BODY

outside diaemeter. The crankshaft is supported on four of these bearings in the crankcase. The crankcase, being of one-piece construction, is bored so that the crankshaft with its bearings can be inserted through the rear of the case. The transmission case is bolted to a flange on the engine-case to form the unit power plant. On the front end of the crankshaft is bolted a spiral gear from which the valves, generator, oil pump, fan and fuel pumps are driven. All gears used in the motor are of the spiral type. Rotary valves are used, doing away with all springs, cams, purshrods, etc. The valves of gray iron have ports straight through them, so the heating due to the passage of exhaust gases is counteracted by the cooling effect of the incoming air during the suction stroke. One valve is placed in the head of each cylinder supported on ball bearings. Both intake and exhaust ports are of large area, the intake putting the combustion chamber in direct communication with the outside air as no inlet pipe or carbureter is used, the gasoline being injected into the cylinder. Lubrication of the cylinders and engine bearings is by splash from the crankcase, a small circulating pump maintaining the required level, regardless of the inclination of the car. The oil is filtered after passing through the circulating pump. A direct current generator of special design is driven

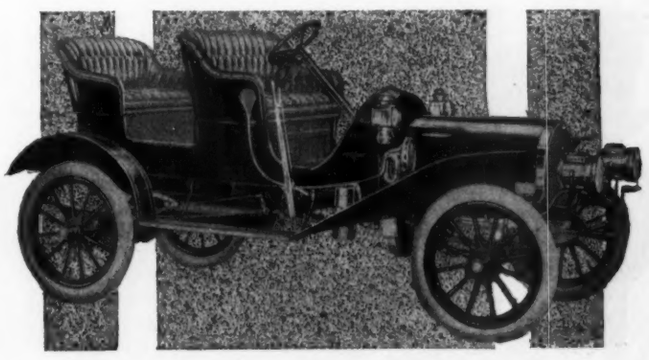
from the forward end of the crankshaft, and supplies current for the ignition and lighting systems, besides keeping the storage batteries fully charged. The batteries are also used in self-starting the engine, being of sufficient size to supply current to the generator which acts as a motor. No distributor or timer is used in the ignition system, both of these functions being performed in supplying fuel by direct injection into the cylinders. For exterior cooling, a cast aluminum fan forces air against the outside of the cylinders. This fan is mounted on ball bearings and gear-driven through a friction coupling. The clutch is of the expanding ring type and runs in oil, the ring being of bronze and expanding into the rim of the flywheel. The transmission, of the selective sliding gear type, giving three speeds forward and reverse, is equipped with D. W. F. ball bearings throughout and is of compact construction. The transmission-case is a single aluminum casting on which is supported the two pedals and the change-gear lever, and is itself supported at the rear end on a tubular cross-member of the frame. The propeller-shaft, which is enclosed in a torsion tube having a spherical bearing on a bushing in the rear of the transmission-case casting, is provided with a double universal joint at the forward end. A leather boot



RIDER-LEWIS MODEL IX RUNABOUT
RIDER-LEWIS MODEL VII TOURING CAR

extends between the rear of the case and the end of the torsion tube, making a grease-tight enclosure for the universal joint. The rear axle is of the floating type fitted with ball bearings. Two sets of brakes expanding into independent drums on the rear wheels are operated by foot pedals; and a gentle but powerful braking effect is also obtained by cutting off the fuel supply to the engine. The front axle is a straight Shelby nickel steel tube of large diameter, giving a road clearance of 12 inches. An extra strong spur gear steering gear is used with steering arms and cross connections all behind the front axle. This steering gear is placed on the left-hand side of the car and a crossrod steers direct on the right-hand knuckle. A wide angle of steering is allowed for, making it posisble to turn the car around in a radius of 25 feet in spite of the 136-inch wheelbase of the touring and roadster cars. Elliptic springs are used at both front and rear. The wheels are equipped with 36 by 4-inch tires, quick-detachables on Nadall demountable rims. The body and frame are of a patented design in that the whole side of the body below the seat line, including the steps, is pressed out of a sheet of steel which also performs the function of a frame. Although the steel used is of comparatively high gauge, its shape and great depth and the manner in which it is braced by the mudguards and tool boxes, make it of exceptionally strong construction. Mudguards are also of pressed steel, bolted direct to the sides of the body-frame, making the body, mudguards and steps a unit, and preventing mud splashing on the step and body sides. The operator's seat is on the left-hand side of the car, but control is of the standard right-hand type bringing the gear-shifting lever in the center of the car. No emergency brake lever is provided, both brakes being operated by the pedals. Engine control is from the top of the steering column.

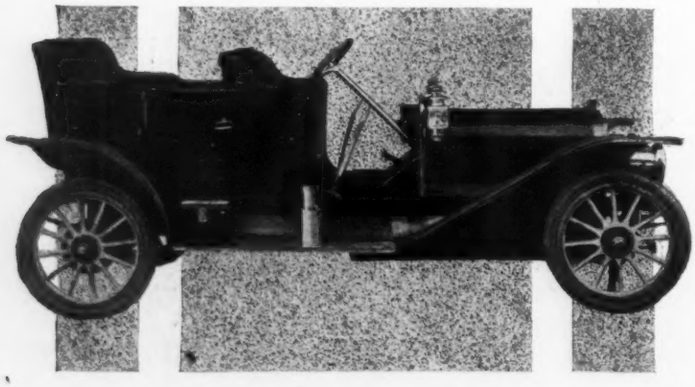
Pittsburg Six—The Pittsburg Six cars are in three models—a three-passenger roadster with disappearing rumble seat, a four-passenger roadster and a seven-passenger touring car, all with practically the same chassis, excepting that for the seven-passenger touring car some frame changes are made to accommodate the larger body. Of particular interest in the Pittsburg six-cylinder chassis is the use of separately-cast cylinders with opposite valves, and for this year a new style of intake manifold has been adopted of the loop variety, in which a horizontal pipe gives off a lateral branch to each cylinder. This pipe is parallel with the feeding pipe from the carbureter of the same length, uniting with it by end loops, so that the mixture leaving the carbureter travels in both directions through the feeder pipe. The company claims the mixture travels the same distance to each cylinder, part of it going in one direction and part in the other. It is claimed that on block tests the motor has shown lower and higher speeds by the use of this manifold. Another change this year is the employment of a Hele-Shaw multiple-disk clutch which supersedes the cone type of former years. This clutch is of the regular Hele-Shaw type with corrugated disks, but incorporating certain changes which the American licensee has seen fit to make for American needs. A further change is the employment of Vanadium steel in the rear axles, to which might be added a line of general improvements in many small details on the car. The Pittsburg six motor for all three chassis is made with cylinders having 4¾-inch bore and 5¼-inch stroke, and is rated at 54-72 horsepower and according to formula is 54.6. In many respects it shows few unconventional features. The cylinders are ground to finish, the crankshaft revolves on seven bearings, the valves have nickel steel heads electrically welded to mild steel stems, and the crankcase, cast in upper and lower halves, makes use of the lower as an oil reservoir in conjunction with splash lubrication. In the basement of the crankcase is the regular oil supply which is elevated by an oil pump through a sight feed on the dash, and thence to the crankcase. A complete double system of ignition is furnished with options given on a Bosch high-tension or Splitdorf low-tension magneto. The independent coil and battery system has its own set of spark plugs, which, like those for the magneto circuits, are mounted over the intake valves. Speed variations are through a selective gearset using three forward changes which, set together with the motor, is carried on



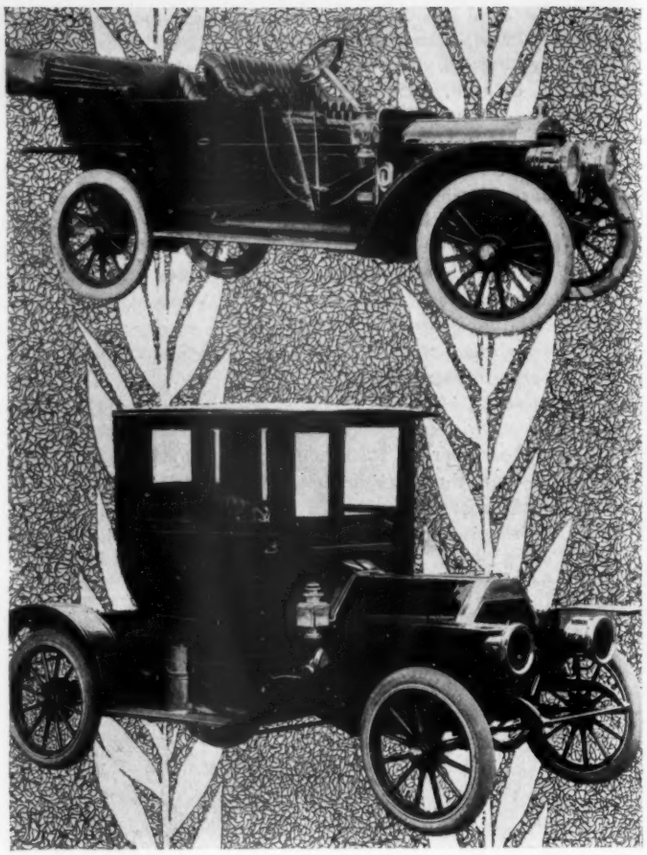
THE RICHMOND MERRY WIDOW

sub-frame members. The set is of Warner construction with chrome nickel shafts and gears and annular ball bearings. The driveshaft with double universals connects with the rear axle, a two and five-eighths to one ratio generally being employed. Four brakes are provided in two independent sets—an expanding set, pedal applied, and a contracting set applied through side lever. No interconnection between the clutch and brakes is used, and both sets are of the metal-to-metal type, giving a total braking area of 364 square inches. A platform spring suspension is used in the rear. The forward axle is an I-beam member, side members of the frame are straight from end to end, the gasoline tank is carried under the chassis at the rear, and the three types of bodies are designed on the straight-line principle.

Halladay—In connection with its five and seven-passenger, 40-horsepower touring car, the Streator company is bringing out an entirely new model. The chassis of this new model may be fitted with either two-passenger roadster with artillery rear seat, surrey type or touring car bodies, and has a four-cylinder motor with cylinders separately cast, being integral heads, waterjackets and valve chambers. The valves are on opposite sides and operated from two camshafts, with integral cams. The crankshaft is heat-treated and ground, and Cramp's ship metal bearings are used throughout the motor. Ignition is by jump spark with storage battery and Bosch magneto as extra equipment. Lubrication is by splash in the crankcase, the level being maintained by means of a gear pump in the sump of the crankcase. A thermo-syphon cooling system is used with a vertical tube radiator, and a fan driven by a belt from the crankshaft. The clutch, of the multiple-disk type, has twenty-eight metal disks. Drive from the clutch to the transmission, which is located on the rear axle, is through one universal joint, and a shaft enclosed in a torsion tube, supported in front on lugs from a cross member of the frame. The transmission, of the sliding gear type, has two forward speeds. Hess-Bright bearings are used throughout the transmission and Hyatt roller bearings in the semi-floating rear axle. The frame is of pressed steel; elliptic springs are used in the rear, and the steering gear is of the worm and sleeve type with the tie rod behind the axle. One set of contracting band brakes is provided, operated by pedal and applying on rear wheel drums. A number of improvements have been made on the model D, 40-horsepower car, among which are adding a multiple-disk clutch, selective gearset, the use of Hess-Bright annular ball bearings throughout the gearset and rear axle, and more room in the tonneau, owing to the lengthening of the wheelbase. The motor is of the Rutenber type. The crankshaft is supported on Cramp's ship metal bearings in the upper half of the aluminum crankcase. Lubrication is splash self-contained, the same as on smaller car. Provisions are made for the attachment of a Bosch high-tension magneto in connection with storage battery system. The water circulation in this motor is maintained by a gear pump on the forward end of the camshaft. The fan is adjustable and attached to forward cylinder. The transmission is located amidships and drive to the rear axle is by cardan shaft with two



RICKETTS SIX-CYLINDER TOURING CAR

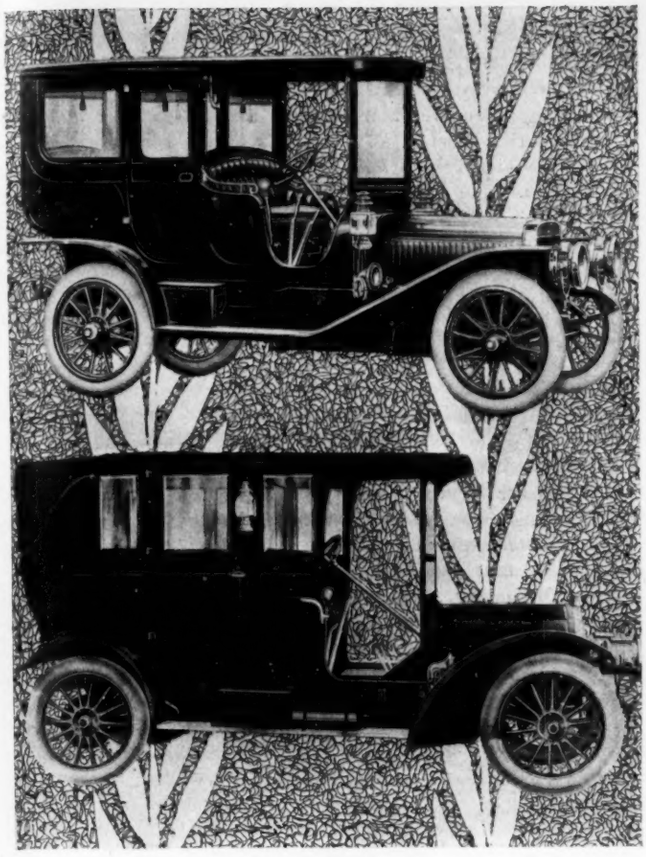


DORRIS MODEL D TOURING CAR

OVERLAND MODEL 30 WITH COUPE BODY

universal joints encased in leather cases. A full floating type rear axle is used, and the rear springs are of the scroll type and equipped with additional coil springs to increase the easy riding qualities. The wheels are fitted with Marsh rims and annular ball bearings.

Auburn—The Auburn company has brought out an entirely new model this year to be handled in connection with its present two-cylinder machine. The new model is equipped with a four-cylinder Rutenber motor. The cylinders are vertical, separately cast with integral heads, waterjackets and valve changers. The valves are all on one side. The camshaft, crankshaft and connecting rods are all drop forgings with ground bearing surfaces, and cams are integral with the shafts. The crankcase, of cast aluminum alloy, is divided horizontally and all bearings are contained in the upper half, the lower portion acting as a reservoir for the self-contained oil system. The lower part of the case is divided into four compartments, and the level is maintained by an overflow arrangement and a gear pump. Features of the cooling system are the solid brass water connections, the bronze water pump attached to the end of the camshaft by means of a square-jawed self-centering coupling, the adjustable belt-driven fan attached to the front cylinder and the cellular type of vertical tube radiator. The carbureter has the primary air shutoff to facilitate starting in cold weather. Jump spark ignition with a standard storage battery, dry cells, Lacoste timer and a vibrator coil on the dash, is the regular equipment, but provision is made for the attachment of a Bosch magneto. The multiple-disk clutch is contained in an aluminum housing which is part of the transmission case and runs in oil. The transmission, of the selective type, has three forward speeds, and is fitted with Hess-Bright ball bearings. Drive is by shaft to the floating type rear axle, which is equipped with ball thrust and roller bearings. The front axle is a one-piece I-beam forging with bronze bushings for the steering spindles. The frame is pressed steel, and elliptic springs are used in the rear. The brakes are of the contracting and ex-

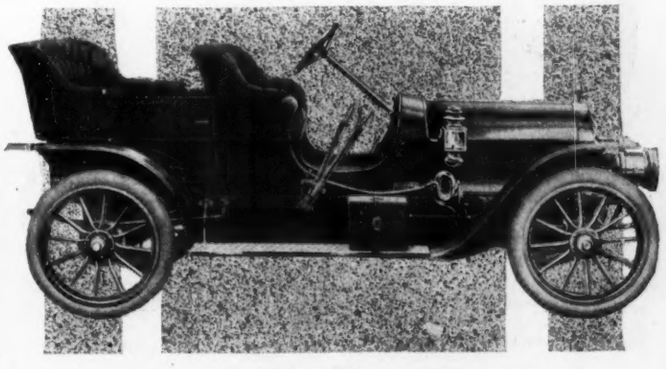


WINTON SIX WITH LIMOUSINE EQUIPMENT
WELCH READY FOR WINTER WORK

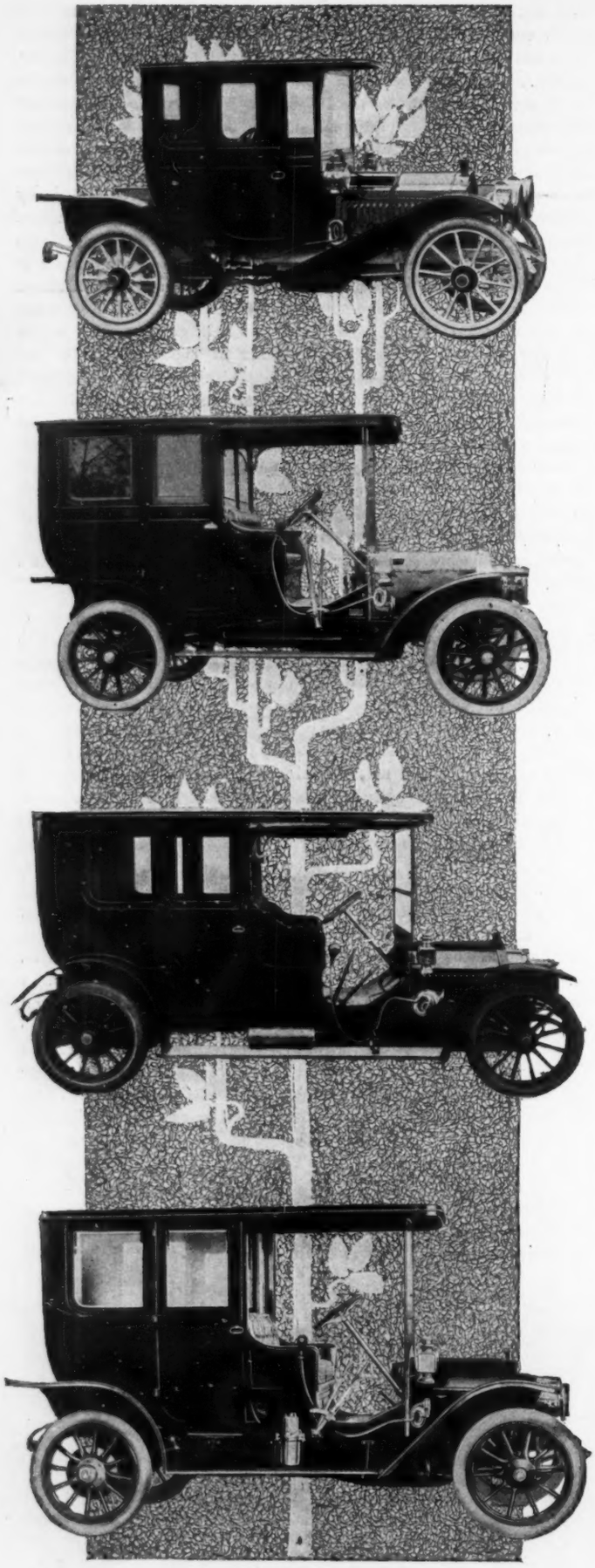
panding type on the rear wheel drums. This car has 106 inch wheelbase, 10 inches road clearance and 58-inch tread. The smaller car is practically unchanged, the same two-cylinder, double-opposed water-cooled motor being used. This motor is rated at 24 horsepower; valves are mechanically operated; lubrication is by means of a steel wire driven mechanical oiler; and jump spark ignition is used. A planetary transmission is employed, giving two speeds forward, and drive is by means of a center chain to the rear axle, which runs on Hyatt roller bearings. The frame is of pressed steel, channel section; the steering gear is of the worm and wheel type; and full elliptic rear springs are used. This car is equipped with touring car, roadster or delivery wagon bodies.

Cameron—The Cameron menu comprises four chassis models with air-cooled engines. The general characteristics of Cameron construction are common to all models, three of which have four-cylinder motors, and the fourth a six-cylinder motor. Model 14, a runabout or roadster, has a four-cylinder motor, rated at 20-24 horsepower, 96-inch wheelbase, 30 by 3-inch tires and weighs 1,200 pounds. Model 15, the featherweight flyer, is a racy-looking runabout, equipped with the 20-24 horsepower motor. It has a wheelbase of 96 inches, 32-inch wheels and weighs 1,075 pounds. Model 16 touring car of four-passenger roadster has a 20-24 horsepower motor, 30-inch wheels, 104-inch wheelbase and weighs 1,350 pounds. Model 11, the six-cylinder chassis, which may be fitted with touring roadster or runabout bodies, has 114-inch wheelbase, 34-inch wheels, the motor is rated at 30-36 horsepower, and the car weighs 1,650 pounds. The general specifications of these cars are as follows: The air-cooled cylinders of the motor are separately cast with integral heads and cooling flanges, and have a bore of 3⅞ inches and a 3½-inch stroke. The valves, which are located in chambers over the cylinder heads and opposed to each other, are operated by means of long vertical rocker arms pivoted on brackets from the sides of the cylinders about midway between the head and the base and operate by means of a roller contact, direct from the cam to the valve stem. The crankcase has pockets for the admission of the rocker arms into the separate camshaft compartments on either side, and its lower portion is removable for the inspection of bearings. Lubrication is splash and force feed, by means of a self-contained circulating system, and a supply tank from which oil is automatically drawn is located just back of the motor. A double system of ignition is used with a Remy magneto and storage battery. Cooling is by means of the flanges on the cylinders and a large belt-driven fan. Gears are all enclosed in an oil-tight case, and the magneto is gear-driven. A standard internal self-adjusting cone clutch is contained in the flywheel, and drive is through a single universal joint just behind the flywheel and a shaft to the transmission on the rear axle. The differential has a large spur gear which engages the various size sliding gears of the cross shaft, and gives three forward speeds and reverse with direct on all forward speeds. The top half of the transmission case is removable, and annular ball bearings are used throughout entire transmission and running gear. The rear axle is of the semi-floating type; elliptic rear springs and spring shock absorbers are used. The front axle of seamless steel tubing has drop forged ends and all steering knuckles, steering arms and connections are heavy drop forgings. The service brakes are Raymond flexible contracting bands, and the emergency brakes are expanding bands, all on the rear wheel hubs.

Rider-Lewis—Three models, all built on a standard chassis with a six-cylinder water-cooled motor, comprise the Rider-Lewis product. These cars are equipped with five and seven-passenger touring, four-passenger toy tonneau, or two and three-passenger roadster bodies. Although they are designed along the lines of modern motor car construction, they have a number of distinguishing features, the most striking of which is the construction of the motor. The cylinders are separately cast with integral spherical-shaped waterjackets; the valves are contained in cages in the heads a little to the right and left of the center, and operated by means of rocker arms from an overhead camshaft, centrally located along the tops of the cylinders. This camshaft is driven by means of double gears and a vertical shaft in front of the motor; and the cams and rocker arms are protected by an aluminum housing. The crankcase is a one-piece construction into which the crankshaft is assembled endwise, and closed in by end plates. Access to the bearings is through a large hand hole plate at the bottom. A force-feed oiler furnishes oil to the crankcase of the motor, and all moving parts inside are lubricated by the splash system. A Fedder's honeycomb radiator, a gear pump located on the vertical shaft in front of the motor, and a belt-driven fan are features of the cooling system. Ignition is jump spark with a Bosch high-tension magneto, also driven from gears on the vertical shaft. A Venturi-tube type of carbureter is used and the intake pipe, which is of the quadruple T type, is in four sections, so that any one of any pair of cylinders can be removed without disturbing the intake pipe connections of the other cylinders. The exhaust pipe has six individual leads



AUBURN, MODEL B, A FOUR-CYLINDER

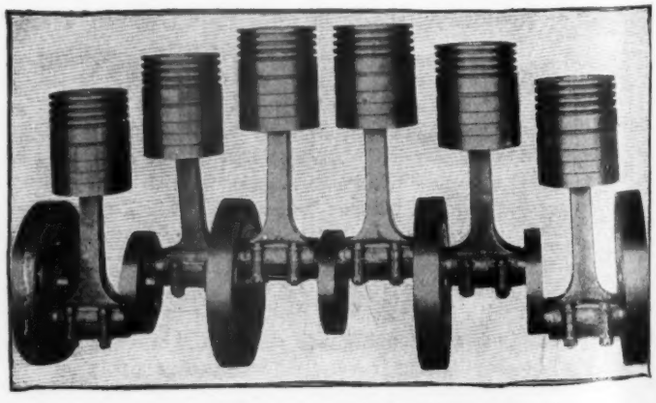


PACKARD THIRTY
DORRIS MODEL D
BERLIET, 20-HORSEPOWER
CHALMERS-DETROIT THIRTY

from the cylinders to the main exhaust pipe below, which is of large diameter. The clutch is of the modified cone type, and the forward universal joint on the driving shaft is coupled directly to the clutch sleeve casing. The transmission of the three-speed, selective type is on the rear axle and forms a compact unit with the differential housing. This axle is of the semi-floating type and chrome nickel steel and roller bearings are features of its construction. The front axle is a steel drop forging of I-beam section. The frame is pressed steel, of drop construction in the rear, and narrowed in front to make a shorter turning radius. The steering gear is of the irreversible type; and three-quarter elliptic springs are used in the rear. Brakes are of the internal and external type, operating on the rear wheel drums.

Glide—The Glide cars are now built in two models, the new addition to the family being the model R roadster. The model G touring car is a refinement of the 1908 Glide, and but few changes have been made. The fan is now placed on an adjustable bracket on the front cylinder; the front axle is dropped instead of straight; 4½-inch tires are used instead of the 4-inch; wider running boards have been fitted, and the steering gear, spring construction and speed change and brake levers have been improved. Both models are identical except for the difference in length of wheelbase, size of wheels and the capacity of the gasoline tank, and the road clearance is greater on the roadster. A four-cylinder Rutenber motor is used, which is of the vertical, water-cooled type with separately-cast cylinders and valves all on one side, operated from one camshaft contained in crankcase. The crankshaft is supported on five phosphor bronze and babbitt bronze anti-friction metal bearings in the upper half of the crankcase, which is of cast aluminum alloy. The lower portion of the crankcase forms a reservoir for the self-contained oiling system. Cooling is by means of a pump driven off the end of the camshaft, an adjustable belt-driven fan and a cellular radiator. Jump spark ignition is used with a four-unit coil on the dash and provisions are made for the attachment of a Bosch magneto as extra equipment. The carbureter is of the Schebler type. The clutch is of the multiple-disk type and runs in oil. The transmission, which is of the selective gear type giving three speeds forward, is located at the rear axle. The rear axle is of the semi-floating type and Timken roller bearings are used throughout the transmission and running gear.

Meteor—Two models constitute the Meteor line, type F, a seven-passenger touring car, and type F1, a baby tonneau roadster. The same chassis is used in both, except that in the roadster model the steering column is tilted more towards the horizontal. A Fedder's square-tube radiator is used and is set back on the frame 2⅝ inches, making the hood that much shorter. The Eisemann ignition system has been replaced by the Bosch dual system with the cylinder and coil and switch located on the dash. The fender design has also been slightly changed. These cars have a four-cylinder motor rated at 40 horsepower, a select-

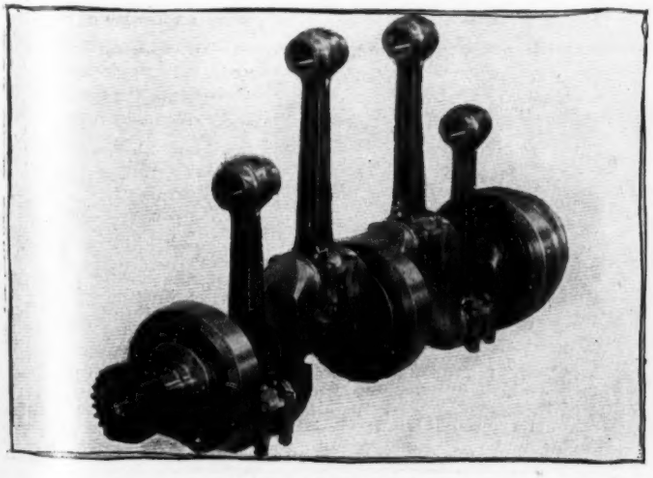


OWEN THOMAS CRANKSHAFT

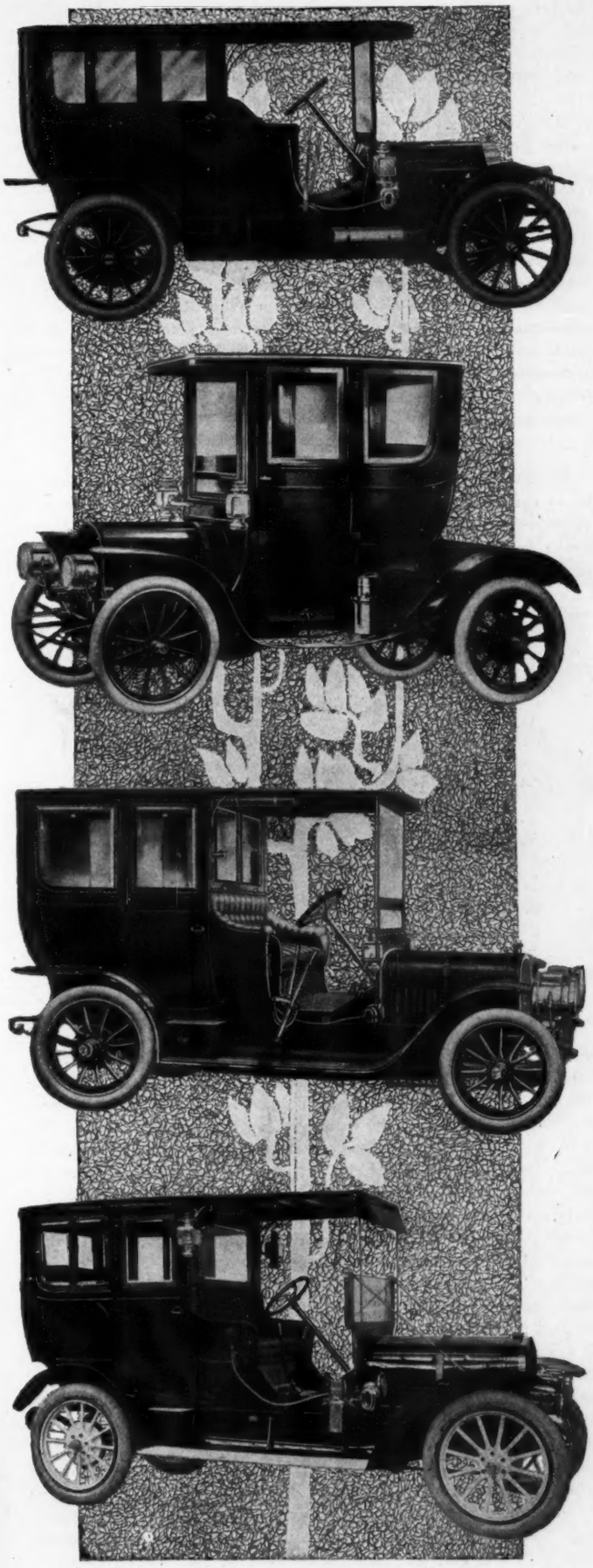
ive gearset and are shaft-driven. A rather unusual appearance is given to the motor by the square cylinder trunks which rest upon the aluminum crankcase. These cylinders are cast separately and the valves are located on opposite sides, operated from camshafts contained within the crankcase. In order to reduce the length of the motor as well as to facilitate casting, the front and rear faces of the waterjackets are cut away and rectangular plates fitted. The crankcase is divided horizontally in two parts; the crankshaft is carried on five bearings in the upper section; and the forward gears are contained in an oil-tight housing. Use is made of hand-buffed aluminum pipes for intake and exhaust gases as well as for both intake and outlet water pipes. The intake and exhaust manifold are similar, and the water connections are at the top side of the valve chambers instead of in the cylinder heads. The magneto is located on the right side just back of the rear cylinder, and driven through a shaft from the forward gear housing. The five-feed mechanical oiler, located in the same position on the opposite side, is driven in the same manner. A multiple-disk clutch of the regular alternating disk type with an easy method of adjusting the clutch tension is fitted; the gearset with its three variations is carried in a one-piece casting, the front end of which is removable; the top covered with a large inspection plate, and which is secured to the side members of the subframe by means of a horizontal web. The drive shaft has two universal joints encased in dust proof housings; and the rear axle of the floating type is equipped with Timken roller bearings. The front axle is of the I-beam type and spindles and steering pivots are also equipped with roller bearings.

* * *

Dorris—The Dorris car is built with touring car, roadster, combination roadster and touring car, limousine and landaulet bodies this year, all on the same chassis, which is somewhat changed from that of previous years. Hose connections have been eliminated and replaced by copper tubing; copper asbestos gaskets are used on the exhaust flanges; the intake pipe is made of copper tubing instead of aluminum; a felt washer is placed in front of the crankshaft bearing to prevent the leakage of oil; the front engine hanger is changed so that the camshaft can be taken out without removing the hanger; the clutch housing has been changed so that the crankshaft can be removed by taking off the gearbox only. The steering gear has been improved; the brakes are now operated by a cam and lined with thermoid brake lining; and the wheelbase has been lengthened 2 inches by placing the cross spring at the rear on a bracket attached to the back cross member of the frame. The motor valves are in cages in the head and operated by means of rocker arms and push rods from one camshaft contained in the crankcase. The crankcase is a one-piece iron casting, with two large inspection plates on either side, held in place by a central yoke for the pair on each side. Parsons bronze bearings are used throughout the



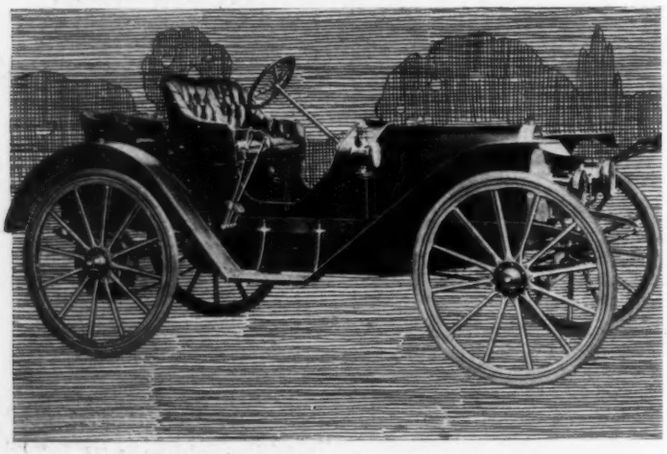
LOZIER CRANKSHAFT



FOUR-CYLINDER KISSELKAR
FRANKLIN WITH ENCLOSED BODY
POPE-HARTFORD, MODEL S
RAMBLER WITH A LIMOUSINE BODY

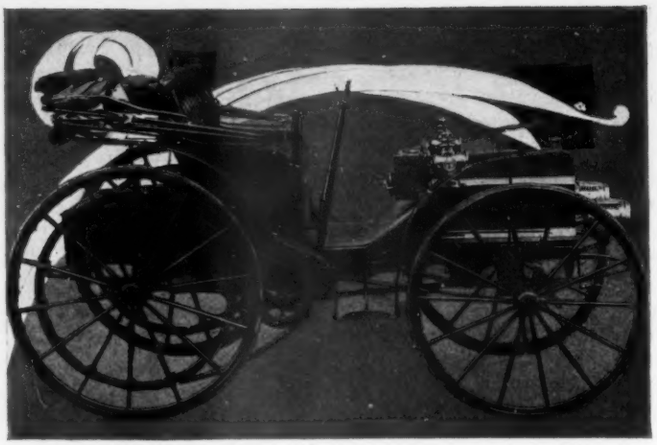
motor, and the connecting rods are drilled for the lubrication of the wrist pins. A mechanical oiler with six sight feeds, one for each cylinder and the two end bearings, is operated from the camshaft by means of an eccentric and rod. Features of the cooling system are the vertical flat tube radiator, fan flywheel, copper water connections, and a vane pump, shaft-driven from the same shaft and gear that drives the Atwater Kent ignition system. Provision is made for magneto if desired; all gears are enclosed in a dust-proof case and run in oil. The clutch is composed of ten disks, bronze and cast iron alternated, contained in an oil-tight case within the flywheel. The service brake is contracting on a drum on the drive shaft just behind the transmission, and the emergency brakes are of the expanding type on the rear wheel drums. Drive from the transmission the semi-floating type of rear axle is by means of a cardan shaft with two universal joints. Timken roller bearings are used throughout the rear axle and wheels. The front axle is a drop forging of I-beam section. Three-quarter platform springs are used in the rear.

Berliet—The Berliet, one of the only two foreign exhibitors to be at the show, is in four models. These consist of four chassis, equipped with all types of bodies, two of which, the 15-20 horsepower and the 20-30 horsepower, are shaft-drive cars. The other two, rated at 40-50 horsepower, are chain-driven. Three of these



BENDIX MOTOR BUGGY IN RUNABOUT FORM

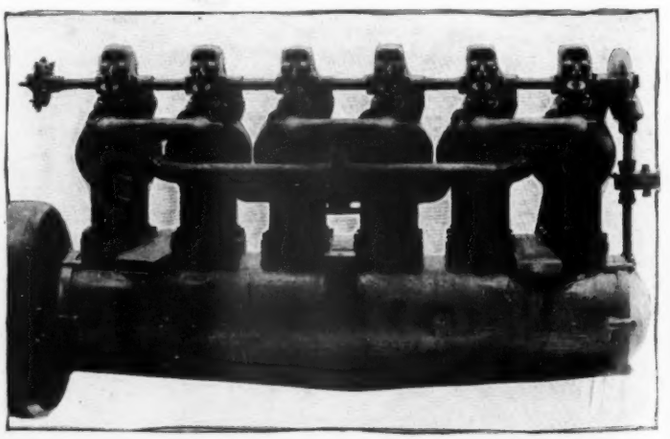
models have four-cylinder motors, and the fourth has a six-cylinder motor. All motors are of the same mechanical construction except that in the six the cylinders are cast in threes, whereas in the four-cylinder, the cylinders are cast in pairs, and in the 15-20 horsepower model, the thermo-syphon cooling system is used. Cylinders are all of the T type with integral waterjackets and valve chambers. The valves are operated from crankcase-contained camshafts by means of pushrods in hardened steel guides. This is a departure from the conventional, as all other manufacturers use a guide of bronze or some other anti-friction metal. The aluminum crankcase is divided horizontally into three sections, all crankshaft bearings being contained between the two upper sections, whereas the lower section forms the sump of the self-contained oiling system. A web from the crankcase fills the space between the case and the side members of the frame. The crankshaft is cut from a solid Vanadium steel billet and Parsons white bronze bearings are used throughout the motor. Features of the cooling system are a honeycomb radiator, a belt-driven fan, and a centrifugal gear-driven pump. Ignition is jump spark with a high-tension Bosch magneto. A Berliet type of carbureter is used which is distinguished by an extremely large mixing chamber, and an auxiliary automatic control is employed with a ball governor enclosed with the timing gears at the forward end of the crankcase. The clutch is of the Hele-Shaw multiple-disk type, and the transmission, which is supported on two heavy channel steel drop cross members, is of the select-



DUER, ONE OF THE HIGH-WHEELERS

ive sliding gear type with four forward speeds and direct drive on third and fourth speeds. Hess-Bright ball bearings are employed throughout the transmission and running gear, and the rear axle on the shaft-driven cars, of the floating type, is hand forged, the side tubes being bored out to receive the driving axles. The front axles are drop forged and of heavy I-beam section. The frame, which is of extra deep channel steel, is braced with heavy cross members. A worm and sector steering gear is used with the tie rod behind the axle; brass dust proof cases are fitted on all joints; and the spindles turn in bronze bushings. Three sets of brakes are on the chain-driven cars; two sets of the contracting band type are located on the jackshaft on either side of the differential case, while the third set is of the internal type acting upon the rear wheel drums. These brakes are operated by two pedals and an emergency lever. The dash is practically clear except for two gauges and an auxiliary air adjustment for the carbureter. On the shaft-drive cars only one foot brake is used, which applies the contracting band to a drum on the propeller shaft behind the transmission case; direct drive in the transmission is only on fourth speed; and the torsion rod is of extra deep channel steel braced with angle iron, tapering to a point at the front.

Ricketts—The Ricketts cars are in three models on a standard chassis. These cars are fitted with baby tonneau, five-passenger touring, and three-passenger roadster bodies. The prominent features of this chassis are the unit power plant with its three-point suspension, six-cylinder water-cooled, valve-in-the-head motor; multiple-disk clutch, selective gearset, propeller shaft with one universal joint enclosed in a torsion tube, the straight line drive, and the floating type rear axle. The cylinders of this motor are cast in pairs and the valves are all operated from one single camshaft contained within the crankcase. The flywheel is located

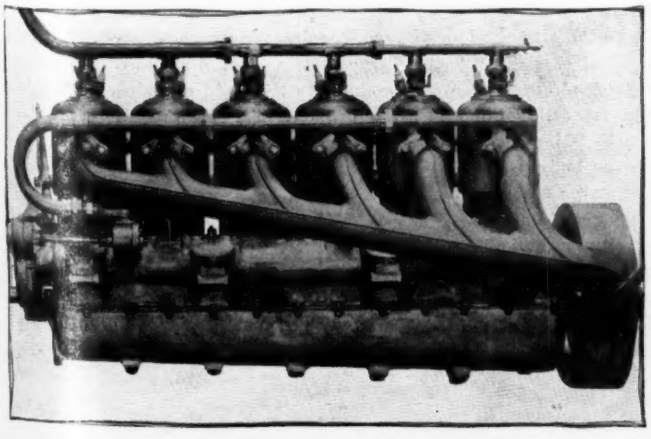


RIDER-LEWIS ENGINE

CLARK-HATFIELD MOTOR BUGGY

in front of the motor and the gearbox is bolted on to the rear end of the crankcase. At the front of the motor between the flywheel and the crankcase is a transverse shaft, driving the water pump on one end and the U. & H. magneto on the other. The timing gears at the forward end are contained in the crankcase proper. At the rear end, the gearset is designed with the mainshaft above the countershaft and the multiple-disk clutch is carried within the gearbox housing. The clutch and brake pedals are attached directly to the gearbox housing. Double ignition is used with two sets of plugs, dry cells, Heinze coil and magneto. Lubrication is self-contained with a gear-driven double gear pump to circulate the oil. Drive to the rear axle is by means of a propeller shaft with but one universal joint at the forward end, which is enclosed in a torsion tube attached in front by means of a yoke, to a cross member of the frame. The rear axle is of the semi-floating type, equipped with roller bearings. The front axle is a Timken drop forging of I-beam section; and a pressed steel frame of channel section is used. The rear springs may be three-quarter or semi-elliptic at the option of the purchaser; the steering gear is of the Gemmer worm and sector type; two sets of brakes on the rear wheels are of the internal and external type; the wheelbase is 116 inches; and wheels are equipped with 34 by 3½-inch tires. The running boards and fenders are of pressed steel with mud guards between them and the frame; and the footboards and web of the steering wheel are of cast aluminum.

Mier—The Mier Co. has four models for 1909 with runabout and surrey bodies. Models A and B are practically the same, except for a few changes in regard to body construction. The chassis has a two-cylinder water-cooled motor rated at 12.8 horsepower, A. L. A. M. rating. Ignition is jump spark with storage battery. A tubular radiator is used in the cooling system. Lubrication is by means of a mechanical oiler. These cars have a friction-drive to the jackshaft and side chains to the rear wheels. An angle iron frame is used and brakes are of the expanding type. The wheelbase is 86 inches and solid or pneumatic tires may be fitted to the wheels, which are 30 inches in front and 32 inches in the rear. Models C and D are identical with models A and B, except for body changes and larger motors which have been introduced.

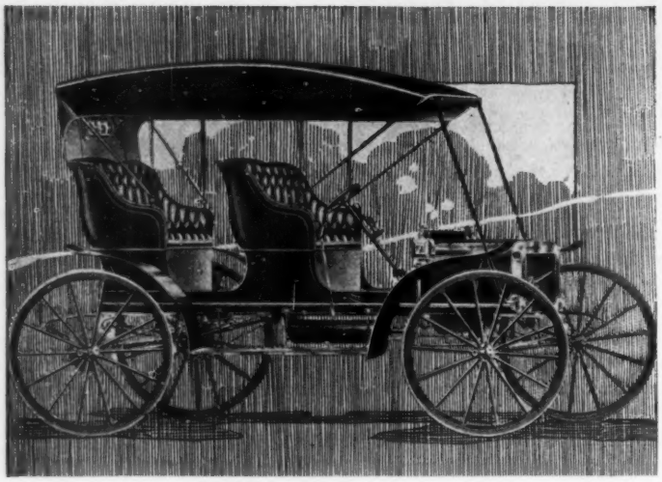


ENGINE OF THE PITTSBURG SIX

Richmond—The Richmond line for 1909 consists of three models—J1, J2 and J3, all of which have the same chassis construction with a few minor exceptions, such as length of wheelbase, size of tires and motor. Model J1, a runabout with a detachable rumble seat, has an 88-inch wheelbase, 3-inch tires and a motor rated at 22.5 horsepower. Model J2, a runabout with a double surrey seat in the rear on an artillery box, has a 96-inch wheelbase, 3½-inch tires and a 22.5-horsepower motor Model J3, a light touring car with baby tonneau, has 102-inch wheelbase, 3½-inch tires and a motor rated at 25.6 horsepower. The motors in these cars are all of the same L type, four cylinders, vertical, air-cooled, with integrally-cast heads, valve chambers and cooling flanges. Valves are all mechanically-operated from one camshaft. The intake valves are located in the top of the valve chamber, and are operated by means of rocker arms and pushrod and the exhaust valves, which are located in the bottom of the valve chamber, are operated direct from the lifters below. The bronze connecting-rods are adjustable at both ends; a five-bearing crankshaft is used, and all bearings are made of babbitt metal. Lubrication is by means of the splash system with an automatic gravity feed oiler. Jump spark ignition is used with the multi-unit coil on the dash and the timer on the forward end of the camshaft. Cooling is by means of air circulation through the cooling flanges of the cylinders, which is maintained by a belt-driven fan, attached to a bracket on the crankcase in front of the forward cylinder. The clutch is of the leather-faced cone type. The transmission, which like the motor is supported on two angle iron cross-members of the frame, is of the selective gear type with two speeds forward. Drive to the rear axle, of the semi-floating type, is by means of a cardanshaft with two universal joints, and the live axles run on long roller bearings with ball thrust bearings. The frame is made of armored angle steel and supported on elliptic springs in the rear of the chassis of the car.

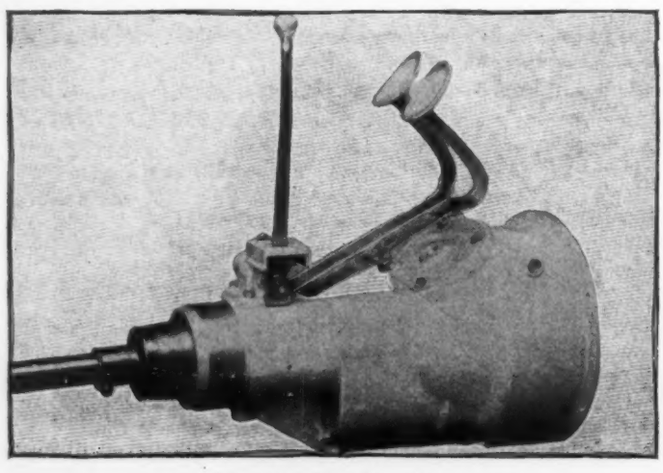
RANDOLPH MOTOR TRUCK, TYPE B

Duer—The Duer motor buggy, manufactured by the Chicago Coach and Carriage Co. for several seasons, is presented to this year's buyers in practically the same design as in 1908, excepting that a larger motor is used, which has a 4½-inch bore and 4-inch stroke, instead of the 4 by 4 type of last season. This new motor is so constructed as to be interchangeable with the smaller size of 1908, a fact which permits of buyers having practically an option on horsepower. The Duer motor buggy has



ZIMMERMAN MOTOR BUGGY, MODEL I

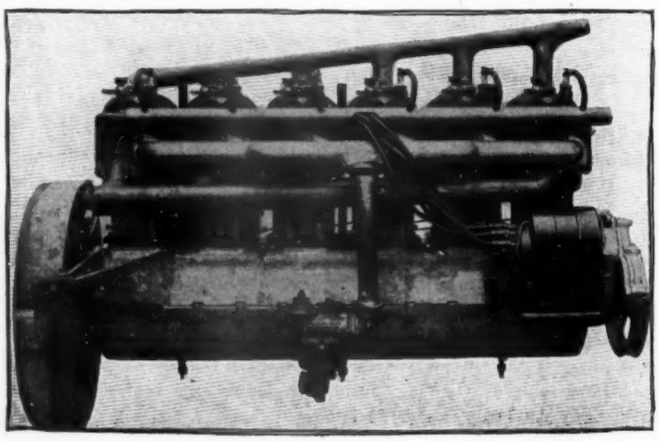
several characteristics all its own in the motor car field, one of which is the direct-drive type of bevel transmission used, giving two speeds ahead and reverse, all on the direct drive. The motor is an air-cooled one located crosswise in front of the bonnet and lubricated from a two-feed mechanical oiler, one lead of which passes to the left cylinder and the other to the cam box, where it feeds onto the two-to-one gear. The right cylinder is oiled entirely by splash. The reason of feeding an oil lead to the left cylinder but not to the right is that the latter is cared for by the splash from the crankcase which, owing to the rotation of the crankshaft, receives a greater quota of oil from this source than does the other cylinder. A change in the running gear of this car has been the strengthening of the axles employed as well as the wheels. The axles are now 1¼ inches square, and the wheels made with 1⅝-inch spokes instead of 1¼. The use of 44 and 48-inch wheels gives the car an out-and-out motor buggy appearance. The transmission system used on this car, as already stated, gives direct on all speeds and is carried in a two-part aluminum housing which serves to enclose a part of the jackshaft. From the ends of this jackshaft cables transmit to sheaves on the driving gear, these sheaves or pulleys being of particularly large diameter. The control of the car rests with a side steering post and one lever. The lever gives the different speed variations and also provides the same control as a clutch, carrying the jackshaft rearward so that the driving cables are too slack to propel. This lever also controls the braking system, the brakes consisting of a shoe on either side in front of the wheel sheaves. The company has been one of the first to commercialize the motor buggy, having placed an open delivery box on the rear, lengthened the wheelbase and made a few other alterations. As a delivery wagon, it has a capacity of 1,000 to 1,500 pounds and a carrying space 32 inches wide and 61¾ inches long. The rig is designed for the use of the small merchant in the delivering of his goods.



OWEN THOMAS GEAR BOX

* *

Zimmerman—The Zimmerman Mfg. Co. has four models for 1909, one of which, model G, a motor buggy type, has a double-disk friction transmission and the other three, models H, I and K, runabout, surrey and three-passenger roadster, are all fitted with planetary transmissions. The motors on these buggies are all of the same mechanical construction, but differ in dimensions and horsepower. All are air-cooled with two opposed cylinders of the L type, which are offset and bolted to the cast-iron crankcase. The valve chambers and cooling fins are integrally cast and the valves, which are contained in detachable cages, are operated by pushrods from a single camshaft contained in the upper portion of the crankcase. This upper portion is removable with the pushrods and camshaft intact. The crankshaft and connecting-rods are steel forgings and fitted with bronze bearings of extra length. Lubrication is by means of a mechanical oiler; ignition is jump spark with vibrating coil on the dash and dry cells. The carbureter is of the float feed type and a ball-bearing roller-type commutator is used. The large fan flywheel materially assists in the cooling. The frame is of angle steel; and whereas the springs on model G are of the elliptic type, two in number and lying in a transverse position, those of the other models are of the three-quarter scroll type, four in number, and attached to each corner of the frame. The brakes are of the expanding type on the rear wheels and operated by pedal. The wheels are 37 inches high and equipped with ball bearings and solid rubber tires. In the models with the planetary transmission, a straight-line shaft-drive is used to the bevel gears and differential on the jackshaft.

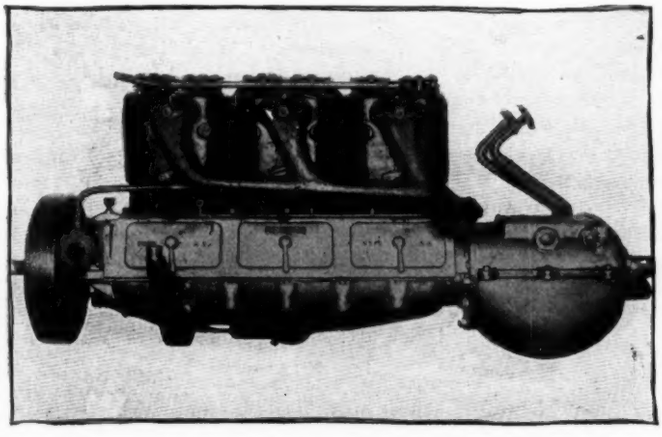


OVERLAND SIX-CYLINDER ENGINE

* *

Clark-Hatfield Auto Co.—The Clark-Hatfield motor buggy varies considerably from the general line of vehicles of this type, in that it makes use of 36-inch wheels instead of the much greater diameter class and has the motor located transversely above the back axle, with a friction-drive system located ahead of the motor with final drive by a single chain to the solid one-piece rear axle. The motor, an opposed air-cooled one of the four-cycle type, has 4¼ by 4-inch cylinders cast with circumferential cooling flanges on the body walls and fins arranged lengthwise on the explosion and valve chambers. The crankcase, made in the usual box type so general on motor buggies, has the crankshaft carried in the lower part and the upper portion serves chiefly in the capacity of a cover and carries the camshaft with all of its valve-actuating parts. Particular care has been shown in the general make-up of the motor, accessibility being kept in the foreground and the secure locking of all nuts insisted upon. The crankshaft, 1¾ inch in diameter, has Parsons white brass bushings 3⅝ inches long, all hand-scraped to size. Connecting rods are 40-point carbon steel provided for adjustment at the crankshaft end by

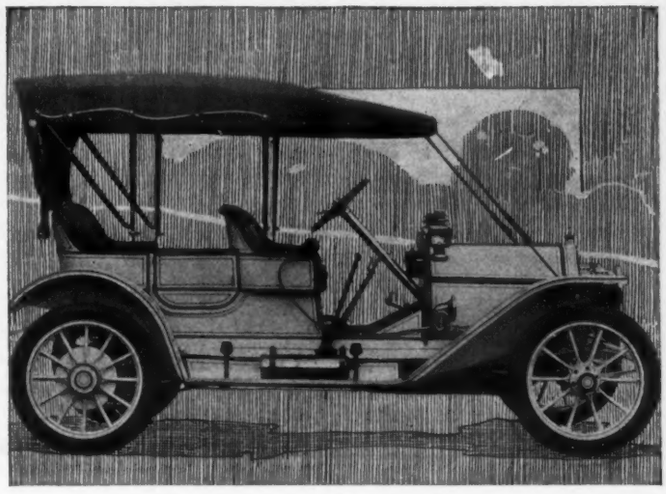
five thin brass liners. In the manufacturing process the cylinders are bored, annealed and finally surfaced by grinding and lapping. The cooling fins are thin and unusually deep, giving a total radiating surface of 3,600 square inches. Both sets of mechanical valves are of nickel steel and are located in pockets on the upper side of the cylinder. The springs are set in pressed steel cups lined with asbestos and elevated well from the cylinder walls in order to protect them from variation due to heat. The friction system of the car consists of a 14-inch diameter flywheel on the face of which is a plate of alzin ¼ inch thick, which material is used because of its frictional qualities. In the center of this disk is a recess 2½ inches in diameter, so that when the friction wheel is in neutral it rests over this recess, making it impossible to wear upon the disk. The friction wheel, 16½ inches in diameter, has a fiber tire or face 1½ inch wide. Back of the flywheel disk is a large ball-thrust bearing. Instead of driving direct from the crossshaft carrying the friction wheel to the rear axle, a second jackshaft, placed ahead of that carrying the friction wheel practically amidship, is used so as to get an easy speed reduction. A single chain-drive from this to the rear axle, which is a one-piece member 2 inches in diameter and running on roller bearings. The road wheels are mounted loosely, that is revolubly on the axle. Inside the brake drums, however, are reverse ratchets and two sets of pawls, the ratchet driven by the axle and the pawls attached inside the brake drums. When the axle revolves, the ratchets revolve with it, and engage the pawls,



BROWNELL SIX-CYLINDER MOTOR FITTED ON SOME SHOW CARS

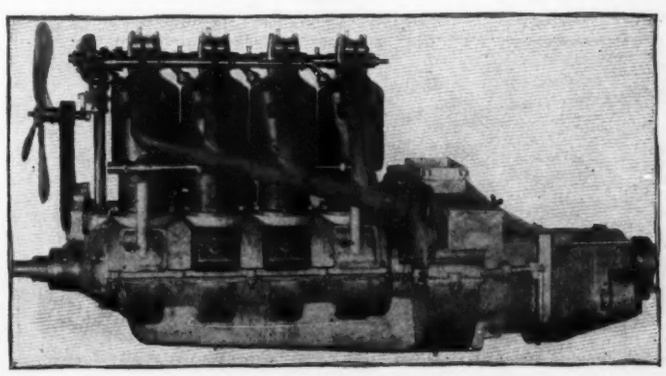
corresponding either forward or reverse, thus driving the wheel. The reverse lever reverses the ratchets to the reverse set of pawls. The brake drums within which these parts operate are 12 inches in diameter and 2 inches wide, and on the outside operates the foot-control brakes. The gear ratio on high speeds is nine to one and on low speeds thirty-five to one. In conjunction with the motor it might be noted that force feed lubrication is used; ignition current is taken from a set of five dry cells and passed through a tubular coil and a carbureter option is given.

Aurora—The Aurora light delivery wagon manufactured by the Emancipator Automobile Co. has a two-cylinder, water-cooled opposed motor rated at 16 horsepower; a planetary transmission; shaft-drive, a floating type rear axle, 80-inch wheelbase, 36-inch wheels equipped with 2-inch front and 2½-inch rear solid tires and has a capacity of 1,000 pounds and weighs 1,500 pounds. The cylinders are of the L type with integrally cast heads, valve chambers and waterjackets; the bore and stroke are 5 inches by 4 inches, respectively, and the valves are operated by means of adjustable pushrods with fibroid bumpers. A two-throw crankshaft is used, supported on two babbitted bearings; a thermo-syphon cooling system is fitted in connection with a cellular radiator; ignition is jump spark with battery and coil, and lubrication is by means of a five-feed mechanical oiler. The transmission is of the planetary type with two speeds forward, running on babbitt bearings and of three-point suspension. The frame is of pressed steel and the steering gear, which is of the worm-and-nut type, has a vertical steering column. Two sets of brakes are furnished, operated by pedal and acting upon the rear wheel drums. Standard roller bearings are used in the rear axle and running gear, and three-quarter platform springs support the frame in the rear.

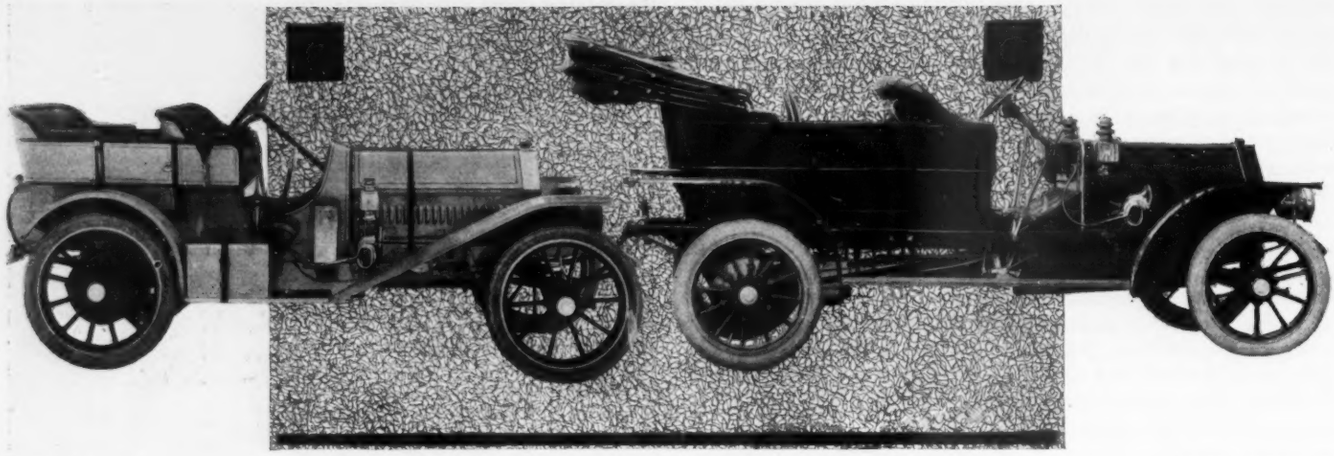


MARMON SUBURBAN, 32-40 HORSEPOWER

Emancipator—The Emancipator company manufactures three models of pleasure cars: A, five-passenger touring car; B, four-passenger toy tonneau, and the Aurora runabout with a rumble seat. Models A and B have four-cylinder multi-unit quadruple opposed motors, water-cooled and rated at 20 horsepower; a planetary three-point suspension transmission; floating type rear axle; 32-inch wheels; 3½-inch pneumatic tires and 100-inch wheelbase. The Aurora model has a two-cylinder, opposed motor, water-cooled and rated at 16-horsepower, and three-quarter platform rear springs. The four-cylinder motor of the Emancipator models is located in front under the hood. The cylinders are cast in pairs and the bases of each pair widen out to form the crankcase when the two pairs of cylinders are bolted together. The lugs by which the motor is suspended from the frame are also cast integral with the cylinder heads. The cylinders being of the L type, all valves are located on the top side and operated by means of offset pushrods. The pistons also are cast in pairs with but one connecting rod for each pair; and the crankshaft, of the two-throw type, rests on two babbitt phosphor bronze bearings. A cellular type radiator is used in connection with a thermo-syphon water-cooling system; ignition is jump spark with battery and coil; and lubrication is by means of a five-feed mechanical oiler. The planetary transmission is equipped with babbitt bearings, and fiber-lined steel bands acting upon pressed steel drums are used for low and reverse speeds, while a cone clutch is used for high speed. The floating rear axle is equipped



MOTOR USED BY JACKSON COMPANY ON MODEL E



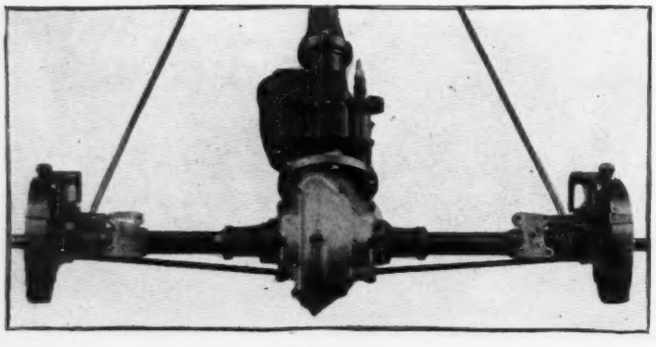
GLIDE, MODEL R

GLIDE, MODEL G

with Standard roller bearings. The frame is of pressed steel; and an irreversible steering gear with the tie rod in back of the front axle is used; and the brakes are of the internal and external type on the rear wheel drums.

American Locomotive Truck—The American Locomotive company is building a large commercial truck equipped with the same four-cylinder vertical motor used in its touring cars, with multiple-disk clutch, selective transmission, which gives three speeds forward. It has side chain drive, a wheelbase of 110 inches; and a carrying capacity of 6,000 pounds. It weighs 4,500 pounds. The motor is rated at 16 horsepower. The cylinders are cast in pairs with integral heads and waterjackets and with valves opposite. The crankcase, which forms the base of the engine, is divided horizontally into two sections with all crankshaft bearings held between them. A vertical section at the forward end contains all timing, magneto and water pump gears. Make-and-break ignition is used, the ignition devices attached to the side of the intake valve chambers being operated by means of pushrods from cams on the intake camshaft. The multiple-disk clutch is composed of forty-five alternating disks of steel and bronze, running in oil. The transmission is carried by a three-point suspension, and the differential and bevel gears on the jackshaft are contained in the gearbox. Hess-Bright bearings are used throughout the transmission case, differential shaft brackets, and in the steering knuckle; motor bearings are plain anti-friction metal, and Timken roller bearings are used in the wheels. The wheels are 36 inches in diameter and equipped with 5-inch solid rubber tires in front and 3½-inch dual tires in the rear.

Staver—The Staver company is marketing one motor buggy model for 1909. It is of the three-passenger roadster type with a four-cylinder motor rated at 22-horsepower, multiple-disk clutch, a sliding gear transmission, 92-inch wheelbase and 38-inch wheels equipped with 2-inch solid tires. The cylinders are cast separately with integral heads, valve chambers and waterjackets; the valves are on opposite sides and operated through pushrods from crankcase camshafts. The crankcase is of aluminum and of two-part construction, supporting the crankshaft in the upper half; the lower portion forms the sump and reservoir for the self-contained oiling system, the oil circulation being maintained by means of a gear-driven gear pump. The thermo-syphon cooling system is used in connection with a honeycomb radiator; and ignition is jump spark with storage battery, with Bosch high-tension magneto as extra equipment. The sliding gear transmission is located on the rear axle and equipped with ball bearings; drive from the engine to the transmission is by means of the multiple-disk clutch, which runs in oil through one universal joint, and a propeller shaft, which is enclosed in a steel torsion tube attached in front to a cross member of the frame by means of a yoke. The rear axle is of the floating type and equipped with ball bearings. A worm-and-sector steering gear, pressed steel frame, and a tubular front axle complete the running gear. Control of the car is by means of spark and throttle over the steering wheel, clutch and service brake pedals, and change gear and emergency brake levers at the right of the driver's seat.



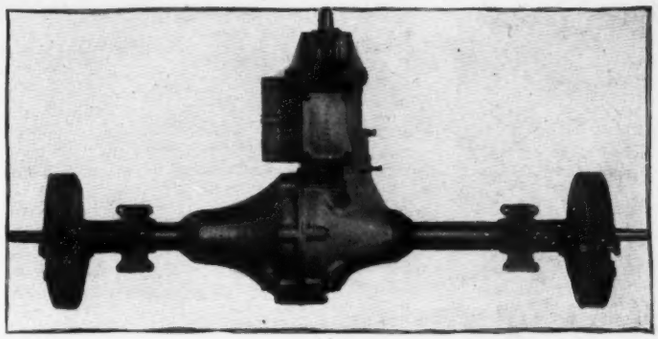
REAR AXLE OF THE REGAL

Randolph Motor Car Co.—The Randolph motor truck is a Chicago product of the past autumn and is somewhat exclusive in its lines in that it is designed for a 1,250-pound load and combines in its make-up a transmission system not common in vehicles of this load-carrying capacity. Its chassis contains a two-cylinder opposed motor mounted transversely in front immediately in the rear of the front axle. Transmission from this is through a planetary gearset of the conventional disk-and-wheel type, the wheel mounted on a cross-jackshaft on the ends of which are sprockets for driving to the rear wheels. The car, built with an 80-inch wheelbase and 34-inch front wheels and 36-inch rear ones, is well adapted for light delivery purposes and is built with enclosed bodies of the wire screen type or the panel variety. Most notable in the running gear is the dropping of the frame at the front end, which lowers the center of gravity to some extent and makes it possible to use a fairly large friction disk without encroaching upon the load-carrying space of the car. The front of the frame is supported on semi-ellipties in the usual manner, but ellipties do service in the rear, these supporting the frame through trunnions at their top centers. In the transmission system a differential gear is used on the crosshaft carrying the friction wheel. When engaging the friction wheel with the friction disk the jackshaft is not carried forward as is so frequently done in friction constructions; but the disk, which is on a continuation of the crankshaft, is thrust rearward against the friction wheel. The motor employed, rated at 22 horsepower, uses conventional waterjacketed cylinders with valve chambers on the upper face of the head, so that the valve springs, push rods, etc., are accessibly located. The crankcase is of that design in which the cylinders bolt to opposite sides and in

which end plates are used for the crankcase bearings which do away with the splitting of the case. The entire top is a removable cover plate, and which, when off, discloses the entire valve-actuating mechanisms and makes it possible to repair them without further dissembly. Cooling is by thermo-syphon system, the water course being the natural one from the radiator base to the under side of the jackets, and from the top of the jackets to a point well up on the radiator. A splash system of lubrication is used within the motor, but the main bearings and pistons are supplied from a force feed oiler located under the footboard and driven by non-slipping chain belt. In addition oil cups are fitted to many of the other parts of the car. The maker has fitted a jump spark system with storage battery current supply and coil and battery carried in the water-tight metal box on the running board of the car. Control of the ignition is through a three-point switch on the dash. The car is furnished with a total braking surface on the rear wheels of 175 square inches, which consists of a double expanding shoe system operated by cams.

Bendix—The Bendix company is building four motor buggy models. These are equipped with roadster and surrey bodies and have a four-cylinder vertical, water-cooled motor, twin-friction transmission, double side chain drive, 96-inch wheelbase, and 41-inch wheels equipped with solid 2-inch rubber tires. Models 9-H and 9-L are roadsters with single or double rumble seats with the same style motor as in models 4 and 5, multiple-disk clutch, selective sliding gear transmission, double side chain drive, 41-inch wheels equipped with 3-inch solid tires, full elliptic springs, and a wheelbase of 105 inches. The cylinders of this motor are cast in pairs with integral heads, valve chambers and waterjackets; valves are all one side and operated from a single camshaft contained within the crankcase. The camshaft bearings are of the annular ball type crankshaft and connecting rod bearings are of Banca babbitt with phosphor bronze wrist pin bushings. Lubrication is self-contained in the crankcase; ignition is jump spark with Splitdorf magneto and dry cells, and one set of plugs; the honeycomb radiator, a centrifugal pump, and a belt-driven fan are features of the cooling system. Annular ball bearings are used throughout the selective sliding gear transmission; two sets of brakes are fitted.

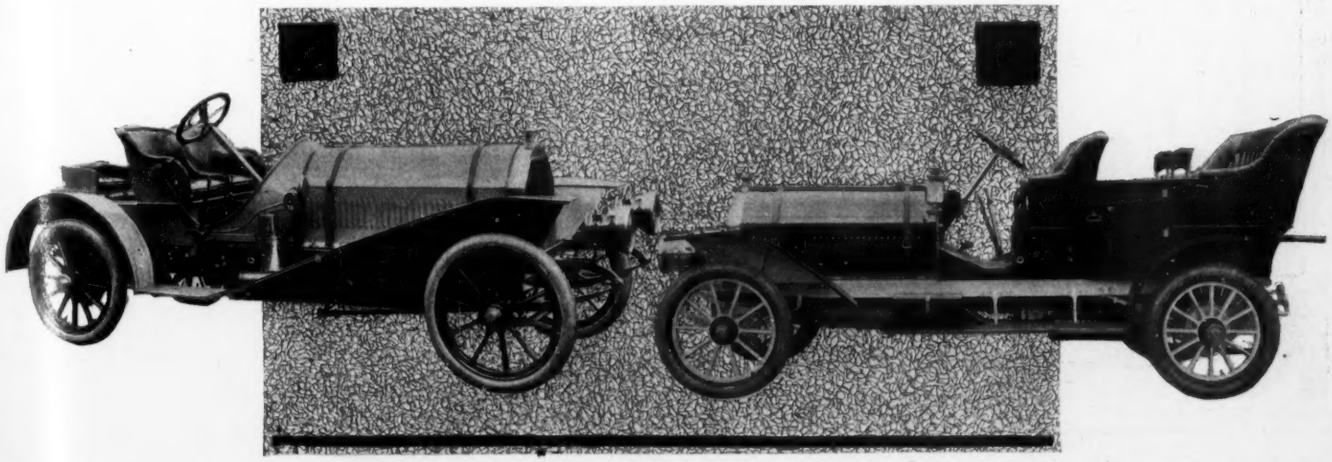
Columbus Electric—The five types of Columbus electric vehicles for 1909 are designated 1000, 1001, 1002, 1100 and 1202, and fitted with Victoria and buggy top stanhope, four-passenger brougham, and two or three-passenger coupe bodies, respectively. Model 1000 has a multipolar type motor of about 2 horsepower and twenty-four cells of 9 M. V. Exide battery. This motor is set in an aluminum supporting frame; fitted with imported annular ball bearings; and is provided with an improved noiseless transmission from the armature to the jackshaft enclosed in an aluminum case. The controller is of the improved radial type and fool-proof. Drive to the rear axle is by means of side chains



Rear Axle of the Rider-Lewis

provided with mudguards. The steering gear is of the side lever type. The service brake operates on a drum on the shaft of the motor and is applied by a further movement of the controller after the motor is cut out of service, and the foot brake operates upon the rear wheel drums. The frame is of pressed steel; elliptic rear and half platform front springs are used; axles are of tubular steel; wheels are equipped with 30 by 3½-inch front and 31 by 4-inch rear tires, and roller bearings. The wheelbase is 74 inches; and the car weighs 1,725 pounds. Model 1001 is the same except that the body is fitted with a Victoria top. Model 1002 is the same as model 1000, except that it has a two-passenger coupe body with an extra child's seat; is inside driven and weighs 1,875 pounds. Model 1100 is also the same as model 1000, except that it has an 86-inch wheelbase, 34 by 4-inch pneumatic tires, a 2½ horsepower motor, twenty-four cells of 11 M. V. Exide, weighs 2,250 pounds and has a four passenger, surrey type body. Model 1202 has four-passenger coupe body, inside driven, 76-inch wheelbase, twenty-four cells of 11 M. V. Exide battery, 32 by 3½-inch front and 33 by 4-inch rear tires; and is otherwise identical with model 1000.

Velie—The Velie will not be exhibited at Chicago, owing to inability to secure a satisfactory location. The company will therefore exhibit at its Chicago salesrooms. The Velie line for 1909 consists of three models built on a standard chassis, and comprises roadster, touring, and baby tonneau types. The chassis has a four-cylinder L type water-cooled motor with a bore and stroke of 4 inches. The cylinders are cast in pairs with integral heads and waterjackets, and all valves are operated from a ball bearing camshaft enclosed within the crankcase. The crankshaft and connecting-rods are drop-forgings. Lubrication is splash, the self-contained system using a circulating pump. Ignition is jump spark, with low-tension magneto and induction-coil, storage-battery and vibrating-coils, two sets of plugs; and may be arranged so as to make up a third ignition system. The transmission is composed of a cone clutch, sliding-gear transmission, enclosed drivingshaft, and semi-floating rear axle.



Pittsburg Six, Model B

Pittsburg Six, Model D

Lubrication

THE great trend in oiling advancement this year, as previously stated in these pages in conjunction with the eastern shows, has been the adoption of one type or another of contained oiling systems in the crankcase, in which a gear, plunger, or centrifugal pump is employed to elevate the oil to the bearings or crankcase, whence it is returned again to the oiler, is strained and ready again. In the following pages are reviewed the progress in lubricating matters in conjunction with cars not treated in connection with the two previous shows. In these the advent of the crankcase oiling system is apparent, such concerns as National, American Locomotive companies and others having made this practically the only change in the 1909 type of motor. A few of the exponents of this type that are referred to in the following pages are: Glide, Owen Thomas, Oldsmobile, Bendix, Midland, and Cameron. Considerable versatility rules in all of them, although the one principal is retained. In one car system is confined to maintaining a constant level in the crankcase compartments; in another case the oil is fed to the crankshaft bearings; in the third it is led to the cylinder walls; and in the fourth it is sprayed against the lower connecting rod bearings; and in a fifth it is supplied through the annual ball bearings carrying the crankshaft. One concern, the Owen Thomas, presenting a new six-cylinder car, has gone to the extent of fitting an oil pump at the front end and another at the rear end of the motor.

Oldsmobile Circulating System

Although the circulating oil system in the Oldsmobile has many of the characteristics common to all of these systems, there are nevertheless not a few individualities in connection with it which show how thoroughly the company has gone into the problem of lubrication of the motor. The leading features of the system appear in Fig. 1, in which R is an oil reservoir extending the complete length of the crankcase and incorporated in the lower half of it, but, as shown in the partial end section of the crankcase at the right of the illustration, this reservoir is beneath one side of the crankcase only. In this motor the oil pump P is located outside of the crankcase at the rear end and adjacent to the flywheel. The pump is on the bottom of a vertical shaft which takes its drive from the camshaft of the motor, and on the top of this shaft a convenient location is provided for the timer. In the oil system the pump P elevates the oil through a passage just to the left of the pump, which is a duct in the crankcase. This vertical duct communicates with the horizontal passage, or oil lead, running the length of the crankcase and from which small holes connect with the four compartments of the crankcase. Within the case a definite oil level is maintained by means of the overflow openings F in the curved bottom of the case, and through which the oil returns to the reservoir R when in excess of the required level. Special attention has been given in this motor to maintain a uniform level in each cylinder compartment by the overflow openings F, and the illustration further shows the vertical walls or partitions by which the case is divided into four compartments to prevent an uneven level beneath the different cylinders when going up or down hill. The central partition W is particularly high, but the other two, W1 and W2, between the first and second and the third and fourth cylinders respectively, are not more than half the height. The company has taken particular precautions to lubricate the crankshaft bearings as well as the lower bearings of the connecting rod. The crankshaft is drilled for lightness as well as to conduct the oil from the main bearings of the crankshaft to the lower ones of the connecting rod. Additional arrangements are made for oiling the connecting rods by cutting slots in the connecting rod head as well as in the bushing, so that when it dips into the splash the oil is forced into the bearing. Equal precautions are taken for oiling the main bearings of the crankshaft, there being a hole K1 drilled to the bearing, as shown in the forward crankshaft bearings, and a pocket K in which the oil

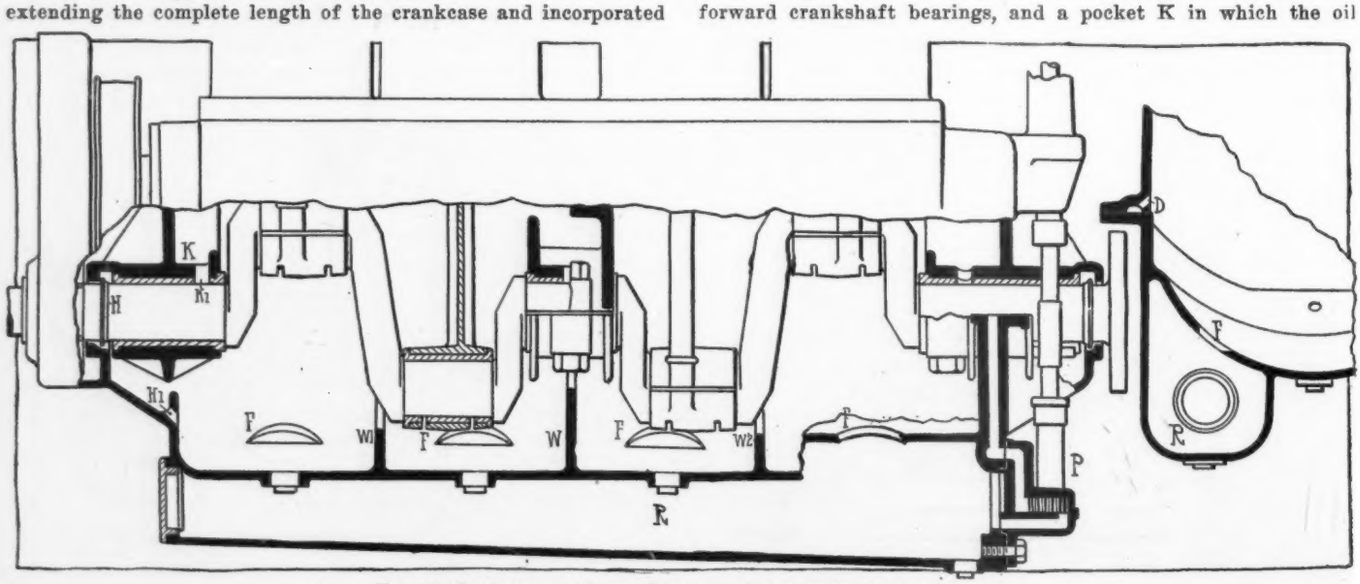


FIG. 1—OLDSMOBILE MOTOR SHOWING CIRCULATING LUBRICATION

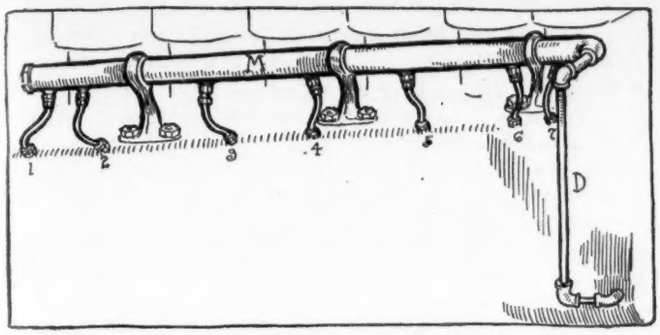


FIG. 2—AUSTIN OIL PIPE TO CRANKSHAFT BEARINGS

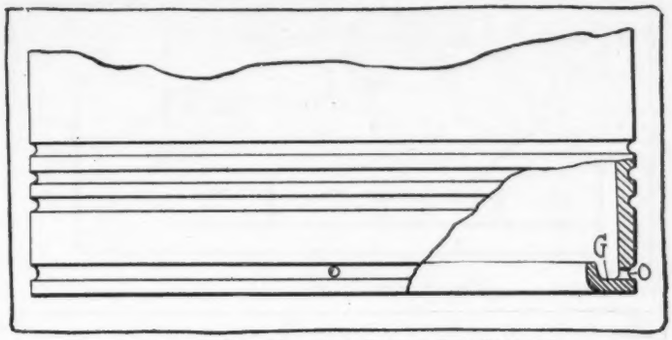


FIG. 3—THE MAXWELL PISTON OIL GROOVE

collects, forming a supply to drain to the bearing. Precautions are taken to prevent the leakage of oil from either end of the crankshaft by an oil ring H formed integrally on the shaft and contained in a small pocket at the end of the bushing. The greater centrifugal speed of this ring throws the oil off which has passed the end of the bushing and would otherwise drip on to the mud apron. This, as well as other overflow oil, collects in a pocket in the crankcase beneath the bearing and escapes through the hole H1 into the crankcase. At the rear end of the crankshaft similar precautions are taken to lubricate the bearing and prevent leakage through the end of the crankcase. Two small oil grooves are cut around the lower end of the piston to aid in lubricating the cylinder walls, and the wristpin is oiled by means of splash, there being suitable holes provided in the upper end of the connecting rods to collect the splash. Baffle plates are not used over the open ends of the cylinders to prevent too much oil reaching the cylinders.

In the new Austin motors a crankcase system of lubrication is used, with the oil pump elevating the oil through a pipe D, Fig. 2, to a distributing manifold M carried along the top of the crankcase at the right side. From this manifold branches 1, 2, 3, 4, 5, 6, 7, lead to the seven bearings of the crankshaft.

New System in National Cars

One of the changes incorporated in the 1909 National cars is the use of the new oiling system in the motor, which is but a splash system maintained in the crankcase, the oil for it being elevated by a gear pump from a sump in the bottom of the case. Fig. 4 illustrates in detail how this is accomplished, the end view at the right showing the general scheme, in which R is the oil-reservoir in a sub-compartment of the crankcase, and P the gear oil pump driven by vertical shaft. From this pump one oil lead conducts the lubricant to a single sight feed SF on the dash, and from thence is returned to a distributing feed pipe FP, shown in the side elevation or left half of the illustration, which pipe is cast on the inside of the crankcase. From this pipe the oil overflows into the case proper, which is divided into halves by a central compartment, each being fed from an exit in the feed pipe FP. When the level within the crankcase proper is at a certain height it overflows through two cups F, one in each compartment of the crankcase, and these cups are located at the respective centers of the crankcase compartment. From these cups the oil is conducted, as shown by arrows, through a large pipe into the center of the oil reservoir, whence it is ready to be recirculated around the motor. To increase the splash lubrication caused by the dipping of the ends of the connecting rods into the splash, long narrow dippers are carried on the connecting rod caps, as shown in the illustration, and which dip deep into the oil. This is deemed sufficient for the motor because of the use of ball bearings carrying the crankshaft. In the top of the wristpins are large wide slots which are filled by the splash. In order to drain the oil from the crankcase proper two dripways are provided, one for each compartment of the case, and each closed by a threaded plug H. On the oiler reservoir is a drain cock for drawing oil to a certain level. In the six-cylinder National cars three compartments are used in the crankcase.

Maxwell Uses Piston Groove

In the Maxwell cars felt washers are used at either ends of the crankshaft to prevent oil leakage, and on the lower ends of the connecting rods are scoops, such as illustrated in Fig. 3, which dip into the splash and lubricate the lower bearings of the connecting rods. On the lower ends of the pistons in the four-cylinder motor an annular groove is formed on the inner side, which is filled from the splash and from which oil is conducted to the outer face of the piston through a series of openings. On the piston at this point is an oil groove, by which the oil is distributed around the complete cylinder wall. In addition to this system of lubrication three additional oil grooves are furnished on the lower part of the piston. On the rear end of the crankshaft the bushings are corrugated to conform with the crankshaft bearing at this point, the result being the preventing of any possible leakage of oil.

Bendix Employs Single Sight Feed

On the four-cylinder Bendix car use is made of a circulating lubricating system, as illustrated in Fig. 6, the oil being elevated by the pump P, through a lead D, through a sight feed SF on the dash, and from this sight feed through a return lead D1 con-

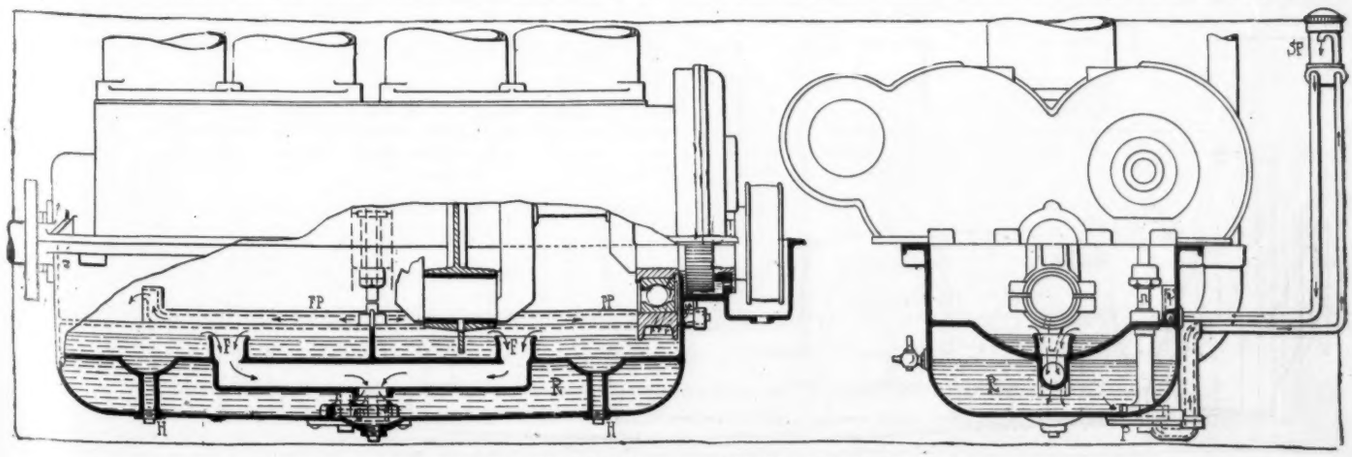


FIG. 4—NEW SUMP OIL SYSTEM INSTALLED IN 1909 NATIONAL MOTORS

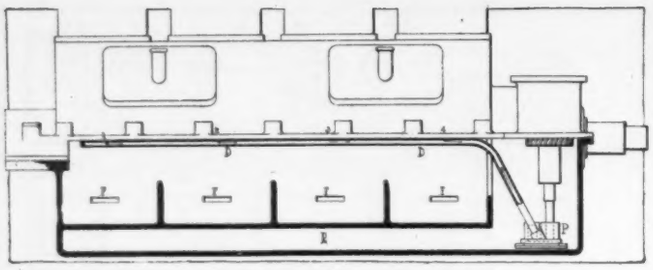


FIG. 5—DIAGRAM GLIDE OIL SYSTEM

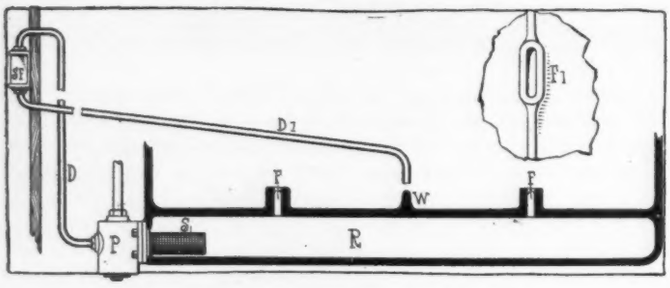


FIG. 6—DIAGRAM OF BENDIX OIL SYSTEM

necting with the upper part of the crankcase. The exit of the return pipe D1 is directly above a wedge top partition W, dividing the crankcase into forward and rear compartments, so that the oil as it emerges from the pipe is divided, part going to the forward compartment and a portion to the rear one. This is the first example of a contained oiling system of this nature in which the whole supply is directed through the sight feed and thence through one lead to the crankcase. In each half of the crankcase is a standpipe F, which determines the oil level. In the center of each partition, as shown in F1, in the upper right of the illustration, is an oval overflow pipe for the excess oil to drain into the reservoir. Once in the reservoir the lubricant is strained through the screen S before being returned to the motor. As in the majority of these systems, the oil pump is carried outside of the oil reservoir, and in this particular case is driven by bevel gear from the camshaft.

Midland's Plunger Pump Scheme

On the 1909 Midland cars an out-of-the-ordinary method of lubrication is employed which is contained entirely within the crankcase but differs materially from others of this type. To begin with it uses a plunger pump in place of the gear type so common with other manufacturers, and in addition to this the pump, as well as its four leads to the compartments of the crankcase, is entirely contained within the crankcase. The layout of this system is diagrammatically illustrated in Fig. 9, the left portion of which shows a side section of the case with the four compartments into which it is divided, and the right part is an end section. Looking at the side elevation first, attention is drawn to the plunger pump P at the forward end, which dips into the oil reservoir R and has its leads 1, 2, 3, 4 connecting direct with the four compartments of the crankcase. These leads are detachable pipes secured to the inner side of the crankcase by brackets. They deliver the oil to the four compartments, in which a level is maintained by the overflow openings F, the value of which can be seen by referring to the right part of the illustration, where the exact relationship of the oil reservoir R with reference to the crankcase appears. This illustration shows in greater detail the reciprocating oil pump P with the plunger P1 carrying on its upper end a roller that contacts with the eccentric E. In this motor the sub-base or oil reservoir is on one-half only and has a capacity for approximately 2 gallons of oil. In addition to the four pipes already referred to there is a fifth leading through a glass tube by way of the sight feed at the rear end of the motor. This sight feed is visible either by lifting the side of the hood or removing the toeboard in the floor of the car. The apparent reason for putting the sight feed on the motor instead of locating it on the dash is to eliminate all possibility of leaky oil pipes or feeds. This motor is a typical example of splash lubrication, in that the spray formed by the dipping of the four connecting rods is relied upon to lubricate the crankshaft bearings, both ends of the connecting rods and the cylinders and piston rings. The upper end of the connecting rod is drilled to collect the splash which rises within the piston. Over the main bearings of the crankshaft are pockets which are filled from the splash and through which the oil is fed to the bearings. Leaking at the two end bearings of the crankshaft is eliminated by having the lower side of the babbitt bushing grooved and drilled, so that any surplus oil fed to the bearings is returned to the crankcase.

Owen Thomas Has Two Pumps

In the new Owen Thomas six-cylinder cars, which are replete with innovations, a novel type of double self-contained pump system of lubrication is in vogue, and which is just partly illustrated in Fig. 8. Before referring to this pump system operation in detail the reader will bear in mind that in this six-cylinder motor the crankshaft is carried throughout on ball bearings of a particularly large diameter, a fact which greatly facilitates the lubrication of the motor. The details of the oiling system are briefly as follows: Use is made of two double-chamber vane pumps P. One-half of each pump forms a sump or chamber in the crankcase, one is located at the forward end of the motor, the other at the rear. In this system oil is supplied to the front end of the engine, to the back as well, and to the transmission. The oil supply furnished to the upper end of the case flows through each compartment and finally overflows into the lower end, where it is returned by the pump from that end, and reversing the operation of oil flowing from the other end, overflows from the last compartment to the end which is then the lowest. There is thus in this system a pump at one end to deliver the oil to the opposite end, whence it returns to the several compartments at the other end. As far as Motor Age is aware this is the first example of the use of a double pump

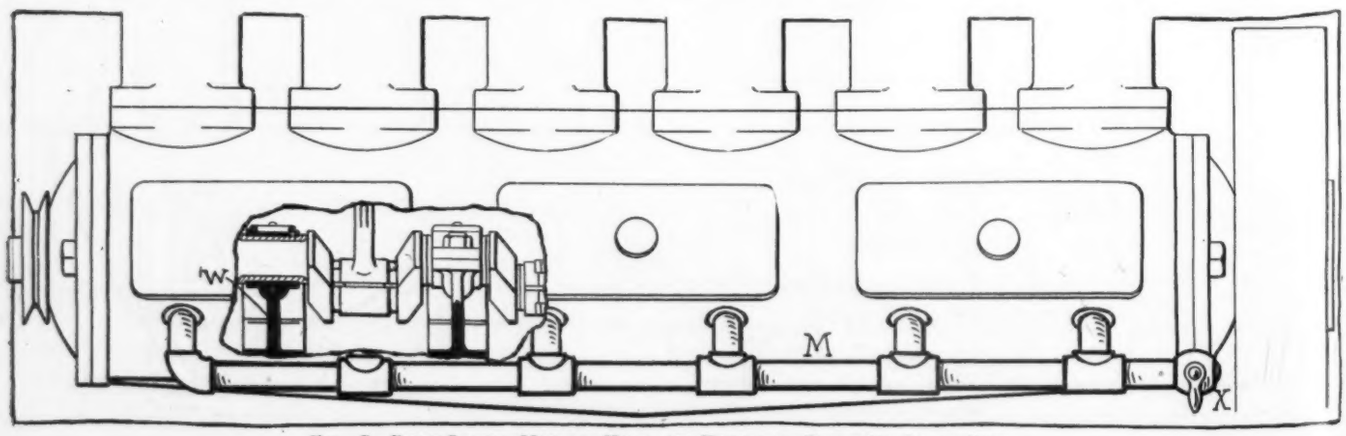


FIG. 7—RIDER-LEWIS MOTORS HAVE AN EXTERNAL PIPE OIL LEVEL PIPE

with a sump at each end of the motor. The exact details of the pump appear in the illustration, in which S is the peripheral suction orifice as seen in the section of the forward end of the crankcase, and N the sliding vane of the eccentric pump, and D the delivery pipe. The discharge of the pump is through the center of the driveshaft D, this shaft being made hollow purposely for discharge work. The shaft is supported in races of ball bearings and is driven from its upper end through spiral gears to the camshaft CS. Near the top of the shaft is carried another spiral gear which drives the pumpshaft F. In this motor the conventional splash system is not made use of in the crankcase. The 9-inch Hess-Bright bearings are completely lubricated while the oil is flowing through the bearings in its travel from end to end of the crankcase. In order to lubricate the piston as thoroughly as possible four oil grooves are cut in each, one of them being on a level with the wristpin, and ¼ inch wide, so that the wristpin wears directly in the cast-iron piston without a bushing, the pin being a hardened and ground piece of Shelby tubing. Beneath this oil groove are used three others $\frac{1}{16}$ inch wide, the lowest of the three being uncovered each time the lower end of the piston leaves the bore of the cylinder at the bottom of the stroke. Baffle plates are not employed across the open end of the cylinders, as the splash is not caused by the connecting rod dipping into the oil, but by the oil being distributed on flowing in a small quantity through the large Hess-Bright bearing.

Many Rider-Lewis Details

On the new six-cylinder Rider-Lewis cars the external multi-feed mechanical oiling system is used, the oiler being attached to the motor base and driven by an eccentric. From it a separate lead connects with each compartment in the crankcase, and on the dash is a bank of sight feeds to make sure of the flow of oil. Within the case splash is depended upon, there being compartments for each of the six connecting rods, two of these compartments or partitions appearing in Fig. 7, at W. In order that the lower connecting rod bearings may be looked after, an integrally forged scoop is provided on the connecting rod cap, which, dipping into the splash pool in the crankcase, throws a surplus against the cylinder which is splashed into the piston and lubricates the wristpin. The use of oil grooves on the pistons further assists in oiling the cylinders. In order that a predetermined oil level may be maintained in the compartment, an external overflow pipe M is provided, which has a branch communicating to each compartment and has at the rear end, which is the lowest, a drain cock X by which the oil in the case can be drained to a proper level. In order to prevent an excess of oil being thrown into the cylinders, thin sheet steel baffle plates are used to cover the lower ends of the cylinders.

The Glide System Outlined

The method employed for lubricating the motor of the Glide cars is that of the conventional sump system contained within the crankcase, and in which the oil from the pump is delivered to four cylinders. This system is outlined in detail diagrammatically in Fig. 5, in which the oil reservoir R extends the entire length of the crankcase instead of only beneath a portion of it as is frequently the case in systems of this kind. The oil pump P is a conventional gear one located at the forward end of the crankcase entirely within the sump compartment, and driven by a vertical shaft which takes its drive through spiral gears from the regular motor shaft. The oil pump is surrounded by a strainer for the prevention of worn portions or any foreign matter getting into the pump and being circulated to the bearings. The pump elevates the lubricant through the feeder pipe D, which extends practically the whole length of the crankcase on one side and has four branches marked respectively 1, 2, 3 and 4, which conduct the oil to the cylinder walls. It is customary in not a few lubricating systems of this type to direct the oil to the crankshaft bearings so that the overflow from these supplies the splash within the crankcase, but the Glide motor feeds direct to the cylinder walls. A level of oil is maintained in the crankcase proper into which the lower ends of the connecting rods dip. Special precautions are taken to avoid an uneven distribution of oil, the chief feature in this respect being three transverse partitions by which the case is divided into four compartments, one for each of the connecting rods. In each of these compartments is an overflow pipe F by which a constant oil level is maintained and through which all excess enters the reservoir R. In the Glide cars the multiple-disk clutch and the universal joint coupling the transmission and real axle run in an

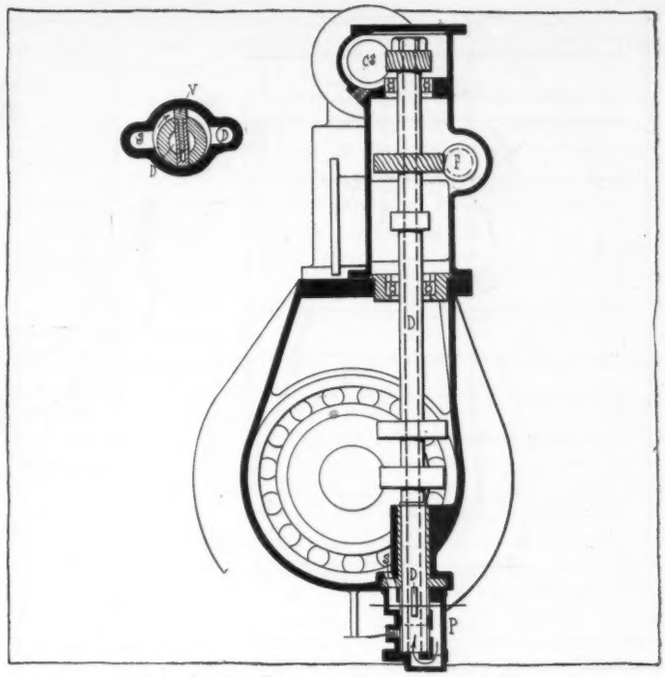


FIG. 8—OIL PUMP IN OWEN THOMAS CAR

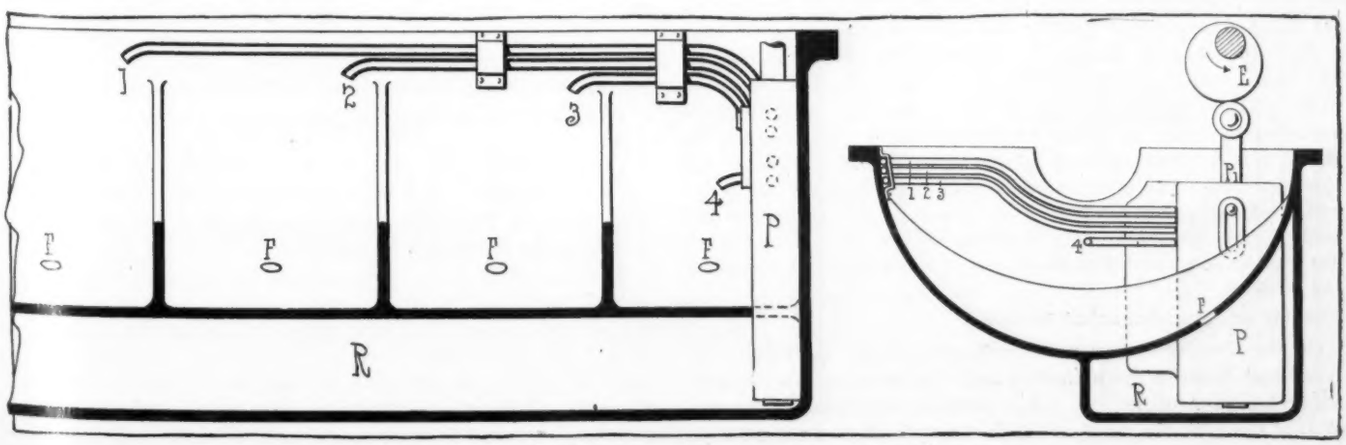


FIG. 9—SIDE AND END ELEVATIONS OF OILING SCHEME IN MIDLAND CARS

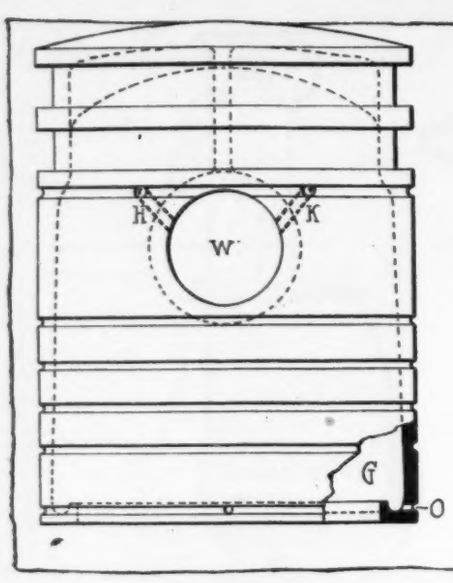


FIG. 10—PREMIER PISTON

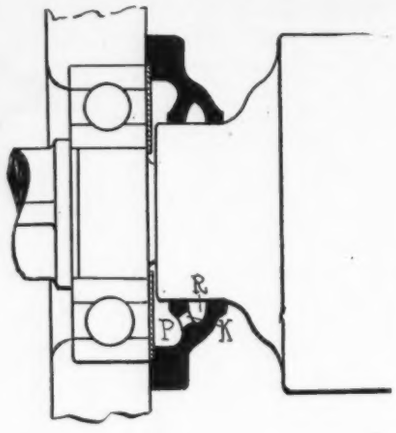


FIG. 11—PREMIER ANTI-LEAK

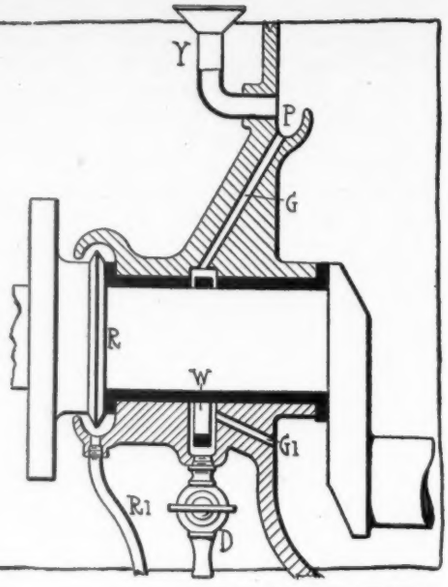


FIG. 12—GREAT WESTERN

individual oil bath, and for other parts of the chassis in need of lubrication, but located where it is impossible to provide the oil bath, grease cups of commensurate size are provided.

Details of Great Western

In the Great Western cars use is made of a mechanical force-feed oiler driven by eccentric and ratchet off the end of the camshaft, the oiler being of the seven-feed bleeder type delivering oil direct to the piston, to the end bearings of the crankshaft and to the crankcase. The crankcase, that is the lower portion of it, is cast into two crescent-shaped bowls, which maintain a level beneath the connecting rods and the main bearings of the engine are lubricated from the splash, which collects in cups at east end and is carried through oil ducts to an oil reservoir in each bearing in which a ring oiler is used. The details of this is shown in Fig. 12, which represents the rear bearing of the crankshaft. Oil fed by way of pipe Y collects in the pocket P, within the crankcase. From this it is led by the duct G grooved in the crankcase housing to a recess, in which is an oil ring W rotating in a pocket. This pocket is normally filled with oil to the height of the overflow pipe G1, whence the oil drains to the crankcase. In the bottom of the pocket containing the oil ring W, is a drain cock D for cleaning and other purposes. The oil ring W is, in brief, a ring hanging loosely on the crankshaft, the upper portion of the bushing of which is cut away at the top. The lower part of the ring is always dipping into the oil and as it is carried around by the rotation of the crankshaft, the oil is lifted to the top of the bearing and automatically distributed. Should any oil pass beyond the outer end of the bushing it is arrested by the integral ring R, which throws the oil off, it is collected in pockets and returned through a pipe R1. At the forward motor bearing the same precautions have been made. In order to completely lubricate the lower bearings of the connecting rods the crankshaft is drilled. There are no baffle plates between the cylinders and the crankcase. Pistons are oiled not only by means of the force-feed oiler but also by splash in the crankcase and in the lower end of the piston are three grooves. The piston or wristpins are drilled for the lubrication of the upper connecting rod bearings and these pins are held in place by a snap ring, which gives the oil from the cylinder wall an opportunity to flow through the hollow pin and reach the bearing.

Premier and Its Mechanical Method

On the Premier motors a Lavigne oiler is used, provided with individual feeds to the cylinders, and with one feed to the camshaft housing, which, in turn, connects with the crankcase. Within the case the usual splash is maintained, and the bullseye is furnished on the lower half to facilitate the determining of the oil level. Baffle plates are not used across the open ends of the cylinders, but in order to spread the lubricant over the cylinder walls a small annular groove G, Fig. 10, is formed on the inside of the open end of the piston. This groove is filled from the splash and its supply of oil leads through a series of openings O to the cylinder wall, there being a semi-circular groove in the piston in the plane of these openings so that the oil is more evenly distributed. The piston or wristpin W rotates in the bosses of the piston, and receives its lubricant from a groove in the piston wall, there being pipes H and K leading from this groove to each end of the wristpin bearing. In addition to these arrangements four other oil grooves are cut on the piston for the distribution of the oil. The rear end of the crankshaft bearing, Fig. 13, has a pocket P which is filled from the splash with a groove G leading through the bushing, and closer observation will show the bushing to be recessed along its upper part, so as to allow of the easy flow of oil throughout the length of the bearing. In connection with this bearing a simple precaution is taken to avoid leakage, which consists in shortening the outer end of the lower half of the bushing and forming an oilway G1, which leads to a pocket P1, whence the lubricant can drain back into the case.

Oiling on Meteor Cars

On the Meteor cars lubrication is entrusted to a four-feed Lavigne oiler with a lead connecting to each cylinder wall and one to the half-time gearcase at the forward end. The lower part of the crankcase has the usual partitions to prevent uneven level when traveling on hills. Each of the oil leads enters the wall of the cylinder at the side, the oil being forced directly against the piston. The crankshaft is not drilled, but splash dependent upon for oiling the motor parts. The connecting rod bearings are grooved and the wristpin bearings being in the piston bosses there is a groove around the piston in the place of the pin bearing and in which groove the oil collects and flows direct to the bearing. Fig. 15 shows how this company prevents oil leaking from the end of the crankshaft, the construction being the integral ring R on the crankshaft and the return groove G through the crankcase housing to the case.

The Rambler Multi-Feed Outlay

In the Rambler four-cylinder models a mechanical oiling system of the multi-feed variety is used, the oiler being located under the left end of the footboard, where it is supported close to the side of the frame and carried in a pan which prevents any leakage. At present the company is using the Precision type, which furnishes oil for splash within the crankcase in which the usual partitions are used to maintain a proper level for each connecting rod to dip into. The wristpin is oiled from the piston, the pin

being hollow, and there is a compression ring below a groove in the piston which collects the oil that is fed to the wristpin. The forward end of the crankshaft is connected directly with the pump and timer gear casing, thereby preventing leakage from that end. At the rear, or flywheel end, is a collecting pocket of annular shape which returns to the crankcase any oil that chances to leak through the bearing. The form of bearing used for the crankcase is such that with a felt placed between the upper and lower halves the leakage of oil is greatly reduced.

Various Systems Employed

In the Pittsburg six-cylinder cars an adaptation of the circulating system of oiling is used, the gear pump being mounted outside of the crankcase and drawing its oil from a reservoir in the base of the case. On the car an auxiliary tank provided with pump is used for adding oil to the crankcase if needed. The crankcase is divided into six compartments by transverse partitions; oil grooves are turned on the lower ends of the pistons for assisting in the splash lubrication of the cylinder walls, and the piston pins are made hollow so that oil is admitted from the cylinder walls through the pin to the bearing. The usual pockets are furnished over the main crankshaft bearings for the collection of the splash. To prevent leakage from the ends of the crankshaft grooves are turned in the outer ends of the bushings and return ducts provided to let the excess oil drain to the crankcase. In addition to this precaution felt washers are used.

On the Kissel cars a multi-feed oiler is used which furnishes lubricant to the several cylinders as well as to the end bearings. Arrangements are made for maintaing the required level within the crankcase.

In the Marion cars a force-feed mechanical oiler is employed and driven by an eccentric from the camshaft and having leads to the four cylinders and to the rear bearing of the crankshaft. Oil pockets are formed in the crankcase above the main bearings of the shaft and oilways drilled to the bearings. Partitions are employed within the crankcase to maintain a constant level, oil grooves are cut in the pistons, but baffle plates are not used across the open ends of the cylinders.

In Reo cars a mechanical oiling system is used. The crankcase is drilled on the inner side for the bearings of the crankshaft and the caps of the connecting rods are drilled for lubrication to the wristpin. The piston has the usual oil groove, only one baffle plate is used over the cylinder, that being for the rear cylinder.

On the Clark-Hatfield motor buggy, the conventional pressure feed system with four feeds is employed, the pressure for conducting the oil being taken from the exhaust. A compression ring is used near the base of the piston. Piston pins are oiled by splash and baffle plates furnished over the piston ends to prevent too much lubricant.

On the Ricketts car a circulation system of lubrication is employed, the lubricant being elevated from the crankcase sump and delivered to the bearings of the crankshaft. From these the oil is conducted through the drilled crankshaft to the lower connecting rod bearings. The cylinder walls and pistons are lubricated by splash.

Many of the makers use resourceful schemes for the lubrication of other parts of the car as well as the motor, as well as the preventing of oil leaking at such places. The Marion cars provide felt washers on the gearbox and rear axles. On the Premier chassis, in case of the transmission, rear axle and hub, steel disks together with felt washers are employed, and Fig. 11 snows the method of avoiding leakage at the end of the crankcase, there being the usual pocket R with passage K through which the oil is returned to the pocket. Oil is prevented in the Meteor cars from leaking in the gearcase and rear axle by felt washers.

In the Great Western machine the same method is used. On Rambler cars are stuffing boxes employed on both sides of the differential in the rear axle at both ends of the transmission. The Rider-Lewis uses felt packing rings on the back axle. On the Midland transmission stuffing boxes are used outside of the bearings, and felt washers due service in the axle. The Oldsmobile makes use of packing glands and felt washers. On the Glide cars attention is called to the lubrication of the spring hangers. The spring is hollow and tapped at one end to take a ⅛-inch pipe which receives the grease cup. The scrolls of the springs are babitted to fit the pins, thus giving a construction similar to that in the bearing.

In the Alco cars of the American Locomobile Co. the 40 and 60-horsepower machines have adopted the new system of crankcase contained oiling, in which a reservoir is provided in the bottom of the crankcase with a capacity of 2 gallons. This is filled with oil which is piped to a pump connected with and driven through spiral gears from the exhaust camshaft. This pump delivers the oil into a tube, running from end to end through the bottom of the crankcase. In the plane of the crankcase bearings and having branch leads connected with the bearings. The oil is forced into the bearings on the under side of the shaft. No other lubrication system is provided for the motor excepting grease cups for the magneto, pump and fan shafts, and a separate lubrication for the magneto itself. In the 22-horsepower car a splash system is used.

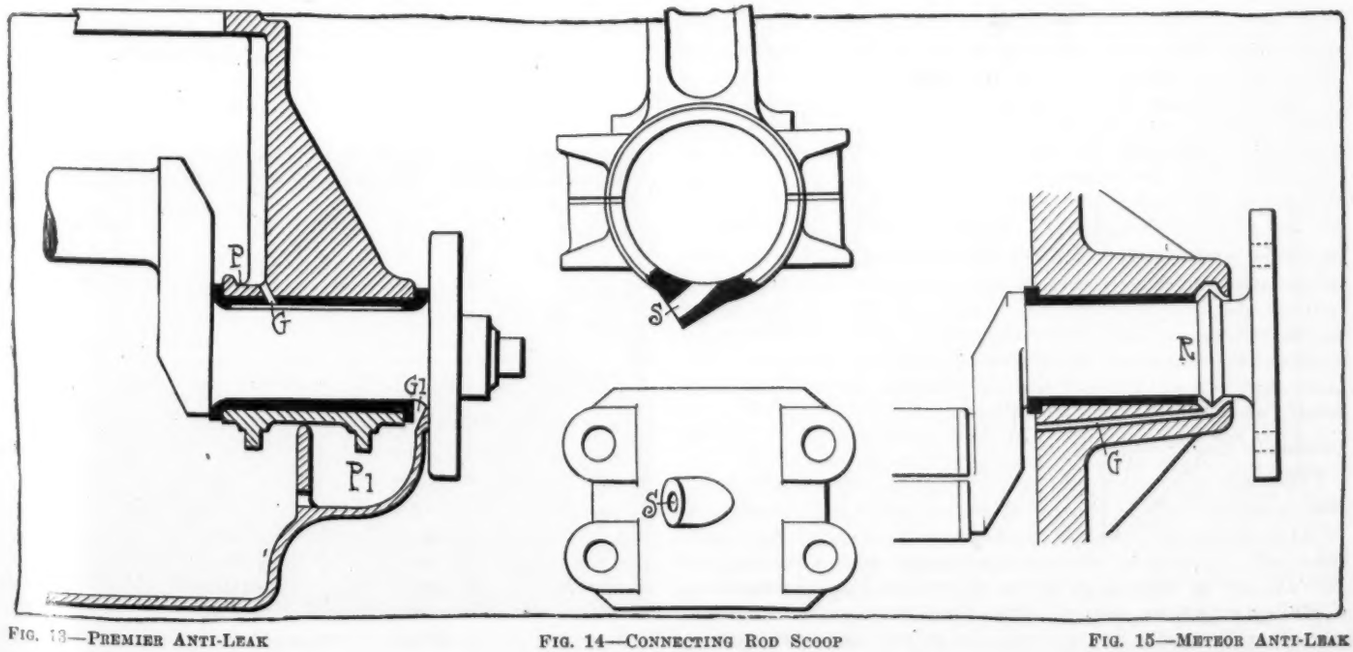
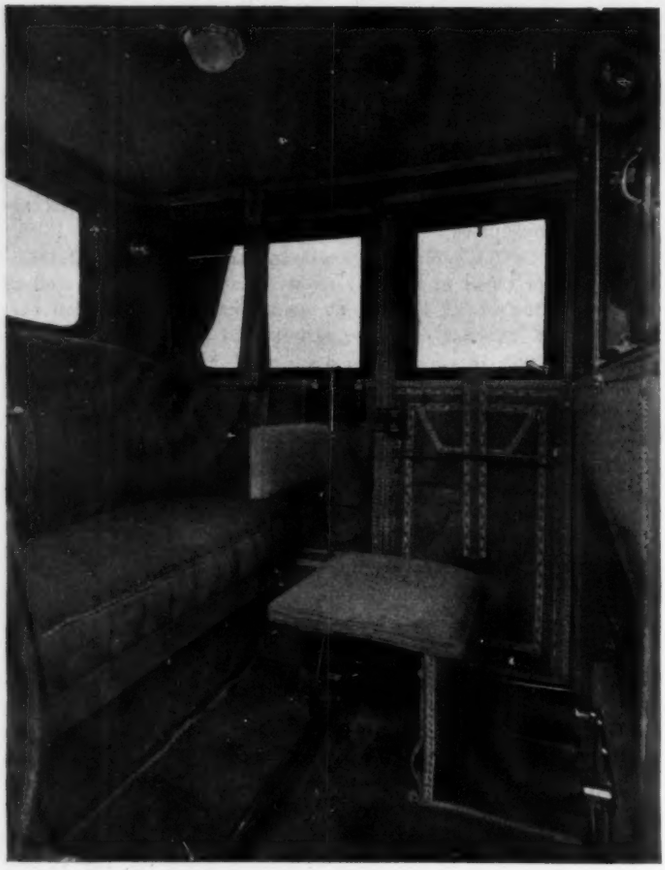


FIG. 13—PREMIER ANTI-LEAK FIG. 14—CONNECTING ROD SCOOP FIG. 15—METEOR ANTI-LEAK



INTERIOR OF STODDARD LIMOUSINE

History of the

IN treating on the subject of limousine cars, a glimpse into the history of the art of coach building, of which the limousine car is merely a development, is likely to be more interesting than a merely technical description of the method of its construction. The progress of the art of coach building, like that of most inventions and discoveries, has been slow. In certain ages it has seemed to make a sudden start, then again to remain almost stationary for a long time.

The history of the art of coach building must be divided into several marked epochs. The first terminated with the change of government at Rome from the rule by consulate to the rule of emperors, about 2,000 years ago. Up to that time there has been little variation in the vehicles chiefly used. The second epoch terminated with the overturning of the Roman empire about 1,500 years ago; during that period which was one marked by display of great wealth, and the indulgence of most luxurious living, several new and larger vehicles were introduced, and many were decorated in a most costly manner. The third epoch commenced with the introduction of vehicles slung upon leather straps, and may be considered to end about the year 1700, when the use of steel springs began to be understood. Right here it might be well to note that for many centuries the suspension of carriage bodies has been between the axles, a feature that only at this late date is being adopted in the construction of the modern motor car. The fourth epoch ended in 1790 when coaches began to assume their present form, size and style. The last epoch commenced with the introduction of carriages hung wholly on elliptic springs, about 1805.

Closed Coaches Used 350 B. C.

The origin of closed coaches dates back several centuries B. C. Roman history of the time of Camillus, 350 B. C., mentions a carriage termed a pelentum—probably the Latin word for "pile-into-'em"—a splendid four-wheeled carriage with a covering to it. The use of these pelenta was allowed as a special favor to a few great Roman women. Then again Herodotus, 450 B. C., and other writers, tell of the vehicles of the ancient Scythians. These were a race of people who inhabited the country near the Caspian sea. They used a two-wheeled cart which consisted of a platform, on which they placed a covering shaped like a beehive, composed of basket work of hazelwood covered with skins of beasts or thatched with reeds. Later on it is learned that on the return of Alexander the Great, king of Macedon, from India, he traveled in a chariot drawn by eight horses, on which a square stage was erected and covered by a tent. His car was followed by an innumerable number of others, covered with rich carpets and purple coverlets.

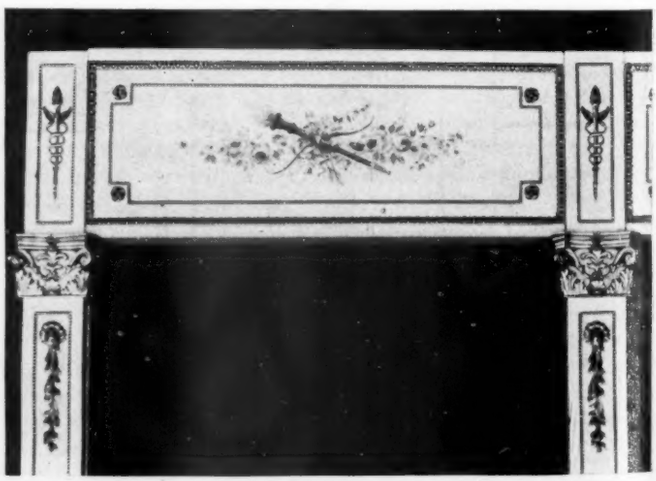
Romans Built Good Roads

With the decadence of the Romans one may well suppose that many of the arts of civilization fell into disuse. The skilled artisans died out and left no successors, for their work was not required; and for some centuries one finds little or no mention of carriages. Ordinary carts were used, it is true, but the great and wealthy moved about the cities on foot or traveled on horseback. The cause which tended to discourage the use of wheeled carriages was the state of the roads. The Romans had been celebrated for the perfection of their highways. There is one, the Appian way, leading from Rome to near Naples, made B. C. 500 by the consul Appius Claudius, which is paved with blocks of stone, and can still be traveled upon. Two duplicates of this road are now being considered in the United States, one to extend from the capitol at Washington to Gettysburg, to be known as the Lincoln way; and the other from Chicago to Springfield, to be known as the Lincoln highway.

Now taking a long stride, it is discovered that in 1267 Charles of Anjou, entering Naples with his queen, Beatrice, rode in a caretta, the outside and inside covered with sky-blue velvet powdered with golden lilies. In an early English poem the father of a princess of Hungary promises:

> Tomorrow ye shall on hunting fare,
> And ride my daughter in a car;
> It shall be covered with velvet red,
> And cloths of velvet about your head.

No traces of glass windows or complete doors seem to have existed up to 1650. It was in the reign of Louis XIV., which lasted till 1715, that the most rapid progress was made in coach building. From the simple wagon-like skeleton body was developed by degrees a beautiful-shaped, carved and paneled piece of cabinet work, such as we can justly allow to be worth the name coach. As the coach began thus to be built, carving, gilding and painting were introduced, and beauty in the shape increased.



PANELING IN A MODERN CLOSED CAR

Limousine

Next came the introduction of glass to the sides. A complete door reaching to the roof, with sliding glasses, followed. Toward the end of the seventeenth century among the wealthier classes decoration was applied to coaches to an extent that would surprise us nowadays. Wheels were again ornamented as in the times of the old Roman empire; the spokes were shaped and carved, the rims molded and the hubs embossed. The panels had beautiful paintings upon them; sometimes the whole was the subject of a picture, sometimes surrounded with a continuous ribbon border of flower work; or the panels were divided into squares or diamonds of diaper work, each little partition bearing a flower or device. The inside linings were of brocaded silk or velvet. It seems clear from this work that over a hundred years ago the art of coach building was in some respects equal to if not beyond that of the present day. All bodies were then made of wood, their timber was carefully selected and dried, the bodies were framed and paneled, the shape and curves and side sweep and turn-under were regulated by very careful drawings, the grooves for the blinds and glasses were well made, and practically the same methods of construction are still in use.

Too Busy to Study Art

Stepping into the twentieth century, the popularity and universal adoption of the self-propelled vehicle, which has been brought to such a high standard of mechanical efficiency, has again stimulated the art of coach building, and coach builders who for many years had been content with their achievements are now forced to produce something of more warm and velvety texture than the leathers and broad-lace now used in the upholstering of 75 per cent of the limousine bodies. It has been said, but unjustly, that Americans are not artistic and that we lack good taste. There was a time when that was so. Then we were too busy fighting the Indians and conquering and opening that great expanse of land reaching from the Mississippi to the Golden Gate. Today we are a wealthy nation and we enjoy our wealth.

The well-to-do of today are not always satisfied with the cold, plain and practical. And as the architect is called in with his drawings, and the home builder begins to study on the architecture of the ancient days, he becomes an enthusiast and his researches lead him to construct a Roman room, a Turkish den, a Jap tea-room, a Louis room, rooms of other times and other lands. So will the coach builder be called in with his drawings, and so will the enthusiasm of our elite lead them to study the designs, decorations and materials of ancient coach building, and we shall have limousines representative of the Roman coach, the Louis coaches, etc.

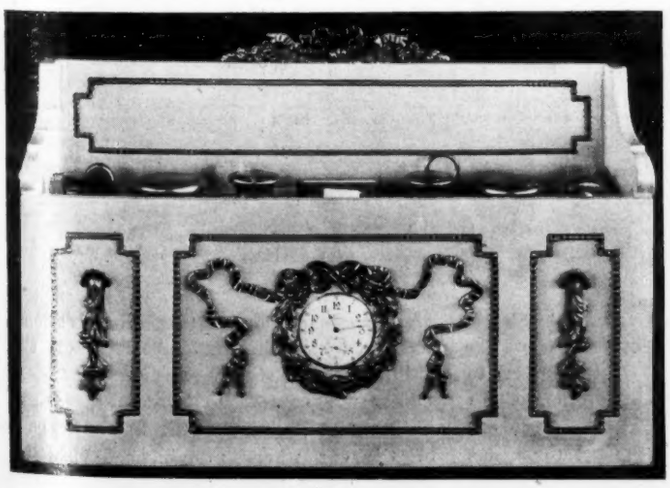
LUXURIOUS EASE IN A BIG PIERCE

A couple of years ago the Apperson company showed an old English coach, but this was a little premature, for although the American people are characterized by their reckless disregard for prices, they want what they want when they want it. Up to the present time the progress of limousine body construction has been chiefly along practical lines, with but little respect for the fine artistic decoration. The materials used in wooden bodies are chiefly ash and whitewood, while metal bodies are constructed chiefly of rolled sheet iron and rolled sheet or cast aluminum. The general design is of three distinct types, know as square, panel and round, these terms referring merely to the rear body construction. The square type are those on which the side and rear panels meet with a sharp edge; the panel type are those whose side and rear panels are joined by a curved panel making a slightly round corner; and the curved construction consists of a single panel for all three sides, the corners being perfectly smooth and exceedingly round.

Morocco Leather Much Used

Three-quarters of the number of cars now in use are upholstered in green, black or blue morocco leather, with a dead or highly polished finish, and trimmed with whipcord or broad-lace; the principal effort toward the artistic being the padded-cell effect which causes every sensitive person to get the creeps on entering the car. But then, on the other hand, there are a number who have deeply considered the decoration of their cars and had them upholstered with broadcloth or Bedford cord, simple yet elegant; while others have shown exquisite taste in the fine interior decorations, draperies rare and rich, furnishings especially made, representative of the highest art, and all arranged with a sympathetic grace in the combination of design, texture and coloring, and indeed in every decorative detail, that would do credit to the technical manipulation of a connoisseur.

In the larger cars folding revolving seats are fitted which are quite comfortable; carriage clocks, women's toilet cases, men's



TOILET NECESSITIES FOR MOTORING USE

World's Crop of Sixes

smoking cases, arm holders on sliding rods, pockets in doors and at the side of seats and in fact in every conceivable place, robe rails, hand rails on doors, sundry patterns of electric light fixtures, coat hooks, hat racks and hammocks for carrying packages, are placed in most convenient places about the interior.

Heater for Limousines

To increase the comfort of these cars the H. & H. heater, manufactured in Chicago, has been applied to many cars and is a part of the equipment of all Pierce-Arrow limousine cars when specified. The latest fad in connection with limousine furnishings are the bouquet holders, which usually consist of a cut-glass vase or bottle supported in a gold or gilded bracket of esthetic design and attached to the center pillar of the front partition or the side pillars of the doors. Megaphone speaking tubes are now a part of the equipment of almost all cars to the almost entire elimination of electric annunciators. The metal trimmings are usually of brass and occasionally of nickeled steel or bone. Up to the present time very little attention has been given to the distribution of the weight of the body relative to its position over the rear axle, owing to the fact that the amount of winter touring, or rather of touring in limousine cars, has up to the present time been comparatively small, its use being confined chiefly to the boulevards of the city. But in the course of time, as the comfort and convenience of touring in these cars becomes more fully realized, more attention must be given this feature of their construction.

Too Much on Outside

Many of the open touring cars, luxuriously fitted limousines and graceful landaulets, as they move along the boulevards, beswaddled in excrescences on each side, resemble a traveler who lost his suitcase in a railroad wreck and reached his home town with his linen under one arm, an extra pair of shoes under the other, and many articles of clothing over each arm. The effect is not a pleasing one, and there is but little reason for it. It can be avoided by a few lectures on body economy. Two seasons ago the external equipment of a car often was an indication of the purse of the owner. The fastidious or at least the ambitious owner who wanted to be a real motorist was not content without the biggest headlights, the biggest dashlamp, the biggest horn, the biggest clock and the biggest everything from speedometer to tire holders it was possible to procure. In not a few cases the real lines of the car were quite obscured by the heterogeneous array of accessories strapped and bolted to the sides of the chassis and body. The trend against this mural decoration scheme has been slow in coming, but is on the gain. Two or three seasons ago not a maker was content to have his gas tank hidden and it was difficult to find a part of the car where prominence could be given to this useful asset. Today not a few of the higher-priced cars entirely hide

Car	Country	H. P.	Formula H. P.	Bore	Stroke	Wheel Base	Forward Speeds
Acme	America	48	51.3	4⅝	5	126	4
Acme	America	60	60	5	5	126	4
Apperson	America	40	40.9	4⅛	5	128	3
American Locomotive	America	60	54.1	4¾	5½	134	4
Austin	America	60-90	72.3	5½	5½	134	4
Austin	America	45-50	43.4	4¼	4½	122	3
Aries	France	40-50	40.9	4⅛	5⅛	.....	.....
Aries	France	15-25	27.2	3⅝	4¾	.....	.....
Benner	America	25-30	29.2	3½	4	100	2
Berliet	France	40	36.1	3⅞	5½	131	4
Berliet	France	60	72.3	5½	5½	126	.....
Bayard-Clement	France	25	29.2	3½	4¾	.....	.....
Bayard-Clement	France	30	36.1	3⅞	4¾	.....	.....
Bollee	France	30-50	40.9	4⅛	5⅛	.....	.....
Bollee	France	60	57	4⅞	5⅞	.....	.....
Bollee	France	75	63	5⅛	5⅞	.....	.....
Brasier	France	32-40	29.2	3½	4¾	123	.....
Brasier	France	45-60	45	4⅝	5⅛	130	.....
Brooke	England	25	31.3	3⅝	4¾	126	.....
Brooke	England	40	43.4	4¼	4¾	126	.....
Bucket	France	18	21.3	3	3⅞	.....	.....
Bucket	France	22	27.2	3⅜	4⅜	.....	.....
Buire, La	France	16	23.7	3⅛	4⅜	.....	.....
Buire, La	France	24	31.3	3⅝	4⅜	.....	.....
Buire, La	France	30	38.2	4	5⅛	.....	.....
Buire, La	France	40	54.1	4¾	5½	.....	.....
Cameron	America	36	36	3⅞	3¾	114	3
Chadwick	America	60	60	5	6	130	4
Clement-Gladiator	France	18-24	29.2	3½	4¾	.....	.....
Clement-Gladiator	France	60	54.1	4¾	5½	.....	.....
Cottin-Desgouttes	France	16	23.7	3⅛	4⅜	.....	.....
Cottin-Desgouttes	France	45	54.1	4¾	5½	.....	.....
Darracq	France	45	54.1	4¾	4¾	131	4
Delaunay-Belleville	France	15	27.2	3⅜	4¾	123	.....
Delaunay-Belleville	France	10	19.7	2⅞	4⅛	111	.....
Delaunay-Belleville	France	25	36.1	3⅞	5⅛	126	.....
Delaunay-Belleville	France	40	48.3	4½	5⅛	135	1
Delaunay-Belleville	France	70	66.1	5¼	5½	138	.....
De Dietrich	France	15	23.7	3⅛	4¾	128	.....
De Dietrich	France	70	63	5¼	5⅞	138	.....
Daimler	England	56	57	4⅞	5¼	126	3
Empress	England	20-24	29.2	3½	5	108	3
Ford	America	40	48.3	4½	4¼	120	2
Frayer-Miller	America	40	39	4¼	5⅛	.....	4
Franklin	America	42	43.4	4¼	4	127	3
Fiat	Italy	45	45	4⅝	5½	130	4
Fiat	Italy	70	57	4⅞	5⅞	127	4
Florentia	Italy	28-38	36.1	3⅞	5½	.....	.....
Gearless	America	30-60	54.1	4¾	5½	124	2
Germain	Belgium	20	27.2	3⅜	4⅜	135	.....
Germain	Belgium	30	31.3	3⅝	4⅜	118	.....
Germain	Belgium	40	38.2	4	4⅜	130	.....
Germain	Belgium	60	54.1	4¾	5⅛	135	.....
Gobron	France	70-90	45	4⅜	8	.....	.....
Hotchkiss	France	50-60	54.1	4¾	5½	.....	3
Hillman-Coatalen	England	1401	60	5	5	133	3
Horbick	England	18-24	23.7	3⅛	3½	114	3
Humber, Coventry	England	30	38.2	4	4¾	118	3
Itala	Italy	60	63	5⅛	5½	.....	.....
Itala	Italy	75	72.3	5½	5½	.....	.....
Iris	England	40	43.4	4¼	5¼	132	3
Jackson	England	13	21.3	3	3½	126	3
J & B Vertex	England	45	66.1	5¼	5	138	.....
Kisselkar	America	60	54.1	4¾	4¾	130	3
Lozier	America	50	51.3	4⅝	5½	131	4
Lozier	America	35	33.3	3¾	4½	116	3
Lanchester	England	28	36.1	3⅞	3	125	3
Lancia	Italy	30	29.2	3½	3⅞	128	3
Londonia, England	England	40	38.2	4	4¾	.....	.....
Mora	America	42-50	38.2	4	5⅛	105	3

WORLD'S CROP OF SIXES

Number of models	139
America	44
France	44
England	34
Italy	10
Belgium	5
Germany	2

Six-Cylinder Cars

Car	Country	H. P.	Formula H. P.	Bore	Stroke	Wheel Base	Forward Speeds
Matheson	America	50	48.3	4½	5	125½	3
Mercedes	Germany	65	54.1	4¾	5½	134	.....
Mercedes	Germany	75	54.1	4¾	5⅞	144	.....
Milde-Gailiardet	France	35-40	54.1	4¾	5½	.....	.....
Mors	France	50	48.3	4½	5⅞	136	.....
Minerva	Belgium	40	40.9	4⅛	4¾	119	4
Maudslay	England	60	60	5	5	138	.....
Miesse-Petrol	England	35-40	36.1	3⅞	4¾	117	3
M. M. C.	England	50	45	4⅝	5⅞	135	3
National	America	50	48.3	4½	4¾	130	3
National	America	60	60	5	5	137	3
Napier	England	30	25.2	3¼	5	120	3
Napier	England	40	38.2	4	4	134	3
Napier	England	45	38.2	4	5	134	3
Napier	England	60	60	5	4	134	3
Napier	England	65	60	5	5	134	3
Napier	England	90	87	6½	5	143	3
Oldsmobile	America	54	54	4⅜	4¾	130	3
Overland	America	35	29.2	3½	4½	116	3
Owen Thomas	America	48	48.3	4½	4	136	3
Orleans	England	45	45	4⅜	4¾	132	4
Owen	England	60	48.3	4½	6⅜	144	4
Premier	America	45-55	48.3	4½	4¼	124	3
Pullman	America	30	33.3	3¾	3¾	104	3
Peerless	America	50	57	4⅞	5½	136	4
Palmer & Singer	America	57	57	4⅞	5½	126	4
Pierce-Arrow	America	36	36	3½	4¾	119	4
Pierce-Arrow	America	48	48	4½	4¾	130	4
Pierce-Arrow	America	60	60	5	5⅛	135	4
Pennsylvania	America	75	54.1	4¾	5¼	129	3
Pittsburg Six	America	72	54	4¾	5¼	124	3
Panhard	France	30	29.2	3½	5½	109	4
Panhard	France	65	66.1	5¼	5½	126	4
Piccard-Pictet	France	28-40	36.1	3⅞	4¾	131	4
Rider-Lewis	America	48	38.4	4	4	122	3
Ricketts	America	31	31.3	3⅝	4	116	3
Renault	France	50-60	54.1	4¾	5½	156	.....
Rochet-Schneider	France	30	40.9	4⅛	5½	.....	.....
Rochet-Schneider	France	45	54.1	4¾	6⅜	.....	.....
Rossel	France	30-40	45	4⅝	4⅝	.....	.....
Rossel	France	70-80	66.1	5¼	5½	.....	4
Rolls-Royce	England	40-50	48.3	4½	4½	136	4
Stevens-Duryea	America	35	36	3⅞	4⅜	114	3
Stevens-Duryea	America	40	54	4¾	4½	142	3
Stearns	America	45-90	69.1	5⅜	5⅞	128	4
Sultan	America	10-12	21.3	3	4⅞	98½	3
Stoddard-Dayton	America	50	51.3	4⅝	5	120	3
San Giorgio	Italy	30-40	36.1	3⅞	3⅞	.....	.....
San Giorgio	Italy	40-50	36.1	3⅞	5	.....	.....
San Giorgio	Italy	50-60	45	4⅜	5	.....	.....
S. C. A. R.	France	35	36.1	3⅞	5½	.....	.....
S. P. A.	Italy	60	63	5⅛	5¾	.....	.....
Scout	England	30	29.2	3½	4½	129	3
Sheffield-Simplex	England	48	48.3	4½	4½	128	2
Siddeley	England	50	51.3	4⅝	5	134	3
Siddeley	England	20	31.3	3⅝	4½	120	4
Simms	England	30-35	40.9	4⅛	4⅞	129	4
Standard	England	20	29.2	3½	4¼	116	3
Star	England	40	43	4¼	5	127	.....
Sultan-Lethimonnier	France	15	21.3	3	4⅜	.....	.....
Thomas	America	72	72.3	5½	5½	140	4
Thomas	America	31	31.3	3⅝	4 5/16	122	3
Tincher	America	90	60	5	6	126	4
Thornycroft	England	45	48.3	4½	5	131	3
Unic	France	25	21.3	3	4⅜	123	.....
Vulcan	England	40	38.2	4	4¾	119	4
Winton	America	48	48.3	4½	5	120	3
Winton	America	60	60	5	5	130	3
Welch	America	75	51.3	4⅝	5	138	3
Weigel	England	60	63	5⅛	5½	144	4

this tank, and others who cannot accommodate it within the body lines have provided a neat box on the running board.

It is particularly dangerous to try to predict how and when many of the necessary car appurtenances can be concealed, or at least made to harmonize better with the beautiful car construction. It is not customary to see highly finished cabinet work grossly decorated with brilliant metals. On the highly finished piano not a particle of metal appears, and recognition must be taken of the art shown in the finish of these instruments. It is true equal efforts are made and as good results obtained in the finish of a limousine body, but immediately this is done the manufacturer has no aversion whatever to immediately bolting to the side of it a set of tire holders. This is no sooner done than other necessaries are loaded on the running boards and the beauty of the vehicle is greatly marred. It is possible that in the next few years there will be considerable diminution along this line, and those parts or accessories which must be carried outside of the body will be vastly reduced in size and made to harmonize more with the body principle.

Luggage-Carrying Space

A few makers are devoting attention at the present time to luggage-carrying space within the bodies, and while what appears to be all the available space has been consumed, in the majority of cases there still remains valuable space beneath the frame where arrangements can be made without interfering with the drive system of the car or endangering the center of gravity to accommodate considerable baggage. One maker has conceived the idea of carrying a spare tire in this location, although the effort to protect it is rather crude. It is a fact that the contour of the under surface of the car has considerable effect on its dust-raising proclivities, and the positioning of baggage space beneath the frame will result in greater dust providing a contour of these baggage-carrying spaces in conformity with the mud apron is not followed. It is frequently regretable that on several big touring cars the baggage is carried beneath the rear seat, or this space used for accommodating tools, so that access to the space is impossible without having the tonneau passengers stand, and in a few cases it is almost necessary for them to get out of the car before the desired tool can be obtained. Baggage and tool-carrying arrangements should be such that every method of accessibility is such as not to interfere with the passengers. Should this be impossible with baggage it should be imperative with tools.

In order that the comfort of the cars shall continue to increase steps must be taken towards the elimination of the dust evil, either by the application on the road surfaces of dust preventives, or the designing of the running gear of the car to produce as little dust as possible. In designing a car to avoid dust the hull of the speedy racing motor boat could be imitated to a degree.

WORLD'S CROP OF SIXES

Manufacturers making sixes	94
America	35
France	25
England	25
Italy	6
Belgium	2
Germany	1

Among the Two Wheelers

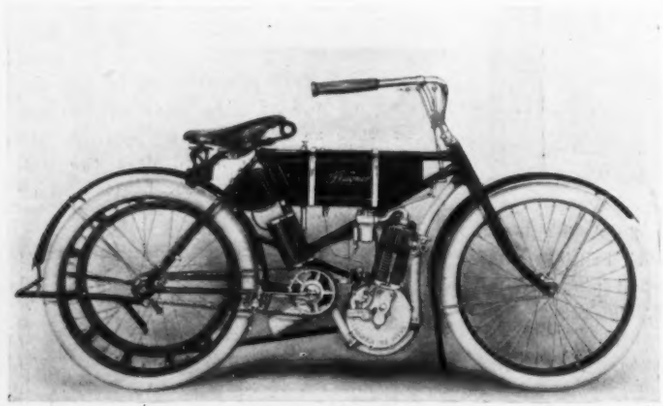
THERE are nineteen exhibitors of motor cycles promised for the Chicago show, and of these six were not at the garden. These concerns include the Minneapolis Motor Cycle Co. and the Thiem Mfg. Co., of Minneapolis; the Wagner Motor Cycle Co., of St. Paul; the Hornecker Motor Mfg. Co., of Geneseo, Ill.; the Magnet Motor Co., and the Armac Motor Co., of Chicago. Hornecker, Thiem and Armac were scheduled for the garden, but for one reason or another they did not exhibit there. The Magnet is a German machine, the importer of which is a Chicago concern, while the others are products of the northwest.

In addition to these there will be the Marsh-Metz, Thor, Yale, Auto-Bi, Merkel, Light, N. S. U., New Era, F. N., Harley-Davidson, Pierce and Reading-Standard, all of which were shown in the east. This will give Chicago a most comprehensive display of the two-wheelers, the main absentees being the Royal-Pioneer, Allright, Simplex-Peugeot, Curtiss, Crouch and Reliance.

Western students of motor cycle engineering will have an opportunity to study the tendencies in this line, how the lubricating systems have been improved, how the engines are mounted in the frame, the trend in transmission, the general adoption of the magneto in the ignition system, the increase of braking surface and what the designers are doing with carbureters. In this last named line it is noticed that there have been few changes, the designers evidently being satisfied with the float feed type with the auxiliary air ports.

Careful Thought Given Lubrication

Lubrication methods have been given much thought in the past year, and among the innovations noted is mechanical oiling as secured by the Pierce and the Merkel. These are the only two in this division. Force feed has for its adherents the Indian, M-M, Crouch, Yale, Reliance, Thor, N. S. U., Torpedo, Magnet, Minneapolis, F. N., Royal and Reading-Standard, while in the sight feed class are the Auto-Bi, Harley-Davidson, Excelsior, Curtiss and New Era. In the case of the Pierce and the Merkel automatic lubrication is secured by means of internal gear-driven pumps. The Royal, which will not be at Chicago, combines the splash and centrifugal systems.



WAGNER, A PRODUCT OF THE NORTHWEST

The suspension of the motor is an interesting study since the advent of the loop frame. This can be split into three divisions—independent, part of the frame and swinging, although there is only one exponent of the last named idea, the Bicar. The Excelsior, Yale, M-M, Curtiss, Auto-Bi, Pierce and N. S. U. make their engines part of the frame. The N. S. U. in one of its models also makes an independent-hung motor, while the Magnet and Reading-Standard use both styles. Those following the practice of making the engine independent are the Harley-Davidson, Indian, Torpedo, Reliance, Merkel-Light, Thor, Royal, Thiem, Wagner and Minneapolis. The Bicar, in its smaller model, has adopted a peculiar scheme in this particular, using a single-cylinder engine; the support is had at two points, there being a hinge joint at the forward one, while in the rear a narrow lug slips into a slot in the main frame. Under this system it is possible to swing the motor at right angles to its normal position by releasing the one bolt holding the lug and disconnecting the oil leads and belt. For this construction is claimed great accessibility for repair work.

Single-Cylinder Holds Its Own

As to the motor itself, the single-cylinder is holding its own, although nearly every concern of importance lists a twin. In the case of the single-cylinder there has been an increase of power. Valve mechanism, too, has been studied carefully, and while the automatic is very much in evidence, there are at least five makers who are using the mechanical inlet valve. Larger valves and the hardening of all parts are other features, and where mechanical valves are used the designers have provided for adjustment. Cylinders and head are now cast in one piece and many are stripping the cooling flanges from the lower part of the cylinder. Studs instead of bolts for fastening the cylinders to the base seems to be a popular idea, while another little refinement in this line is the use of glass windows in the base for the purpose of ascertaining the quantity of the oil in the crankcase. The advent of the twins has caused the adoption of the practice of providing separate exhaust tubes for each cylinder and in the others larger and longer exhaust pipes are to be found.

Brakes are a most important part of the motor cycle and here the designers have been extra busy. Band brakes are coming in, and on the Pierce it is noticed that there is a hand brake, while the M-M has an auxiliary which is positioned on the belt pulley and which is operated by the foot. On the foreign machines internal expansion brakes are the practice. Coaster brakes have been improved by making them stronger and with more braking surface.

Belt Drive Taken Up

Belt drive has been taken up by many of the makers, among the converts being the Indian, Thor and Reading-Standard. Hendee employs a compensating sprocket on the models which he equips with the V belt drive, the idea being to relieve the strain caused by the wedging of the belt. Among the followers of the chain-drive some remove the countershaft bracket beneath the motor and place it to the rear for the purpose of securing a straight line drive. Only three machines at the garden show had

two-speed gear arrangements, while the Pierce and the F. N. are the only ones who depend upon shaft drive. As a substitute for this two-speed idea the adjustable pulley is pressed into service by some and seems to give satisfactory service on belt-driven machines.

As noted before, the magneto as applied to the motor cycle seems to have come into its own, although the problem seems to be how to properly place the device. In most instances the magnetos are driven by an enclosed chain of gears instead of chains. Switch plugs now are generally located in the coil, while in the case of the Curtiss the plug is placed in the commutator and the circuit automatically broken.

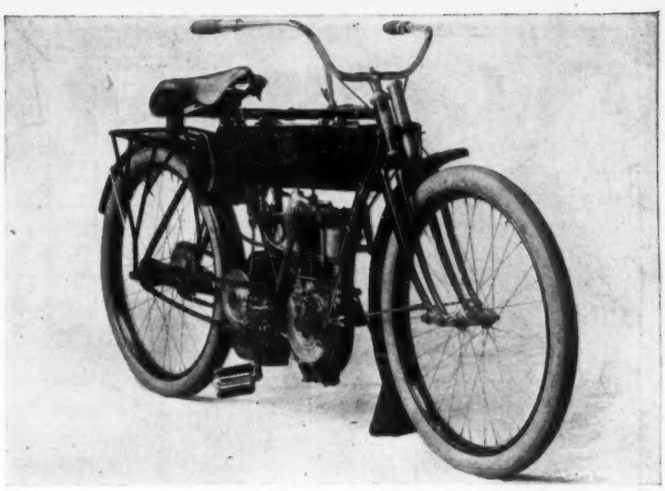
Loop Frame in the Limelight

The loop frame has come into great popularity and the demand for a low position has been met by either cutting down the frame or inserting the seat post horizontally in the top tube. The Merkel retains its spring frame, while the Greyhound uses a supplementary spring frame that is detachable. In the way of wheels the run is toward the 26-inch size and tires now are generally 2½ inches in diameter.

Minnesota comes to the show with three makes of the two-wheelers, none of which has been seen in public exhibitions before this year. Two of them, the Minneapolis and Theim, come from Minneapolis, and the third, the Wagner, is a product of St. Paul. Of these the Thiem is out of the ordinary because of the fact that one of the two models is fitted with a two-speed hub, which permits of the doing away with pedals and the securing of a free engine. In general details the two machines closely resemble each other. The cylinder and head are cast integral, with the valve chamber part of the cylinder, but with an air space between itself and the cylinder. The exhaust port is very large while the exhaust and inlet valves are larger than ordinary. The designer has aimed to secure light and strong connecting rod and piston, the connecting rod being made of I-beam section and with large ball bearings. The valves are interchangeable and are made of nickel steel drop forgings, while the exhaust valve cam and cam gear are integrally made from a solid steel bar, the cam being lifted by first coming into contact with a hardened roller held in the valve lifter, which in turn lifts the valves and relieves the push rods from strain. Oiling is secured by means of a force pump, which is located in the tank in which the lubricant is carried.

Wagner Has Four Models

Four models are in the line of the Wagner Motor Cycle Co.—roadster, semi-roadster, woman's drop frame and tourist. All but the roadster will be equipped with the new Wagner motor, which has 3½ horsepower and uses a 3¼-inch bore and 3¼-inch stroke. The roadster uses a 2¾-horsepower engine. No changes have been made in frame construction, the diamond loop and twin fork still being the features, just as they have been for the last 8 years. The 28-inch wheels are fitted with 2½-inch tires and the wheelbase is 53½ inches. The transmission is by means of a ⅞-inch rubber V belt, while the lubrication is effected by means of an automatic sight feed or force pump. Other refinements include a double grip control and exhaust lift and automatic switch. The mud guards and stands are fastened

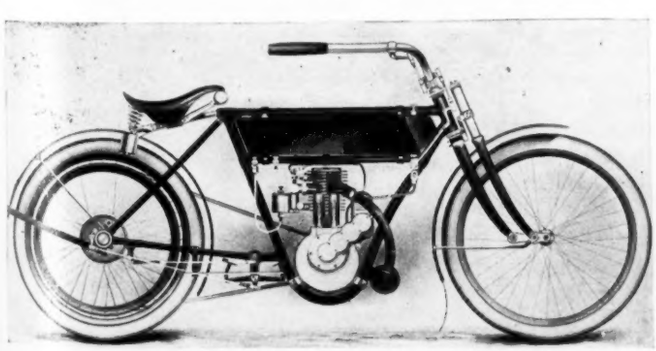


SINGLE-CYLINDER MINNEAPOLIS MOTOR CYCLE

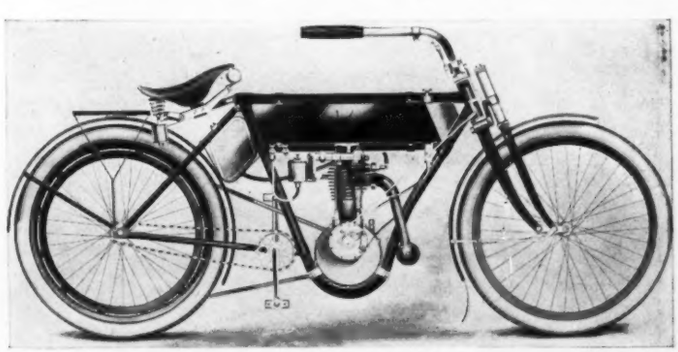
independent of the rear axle and the rear wheel can be removed without interference.

The Minneapolis has six models, but all of them are not ready for the show, so the maker will content himself with exhibiting a single-cylinder chain-drive, double-cylinder chain drive and a single with a combined chain and belt transmission. On all of these models is fitted the Minneapolis company's two-speed and free-engine gear. The Thor motor is used and other Thor parts of a standard nature are utilized.

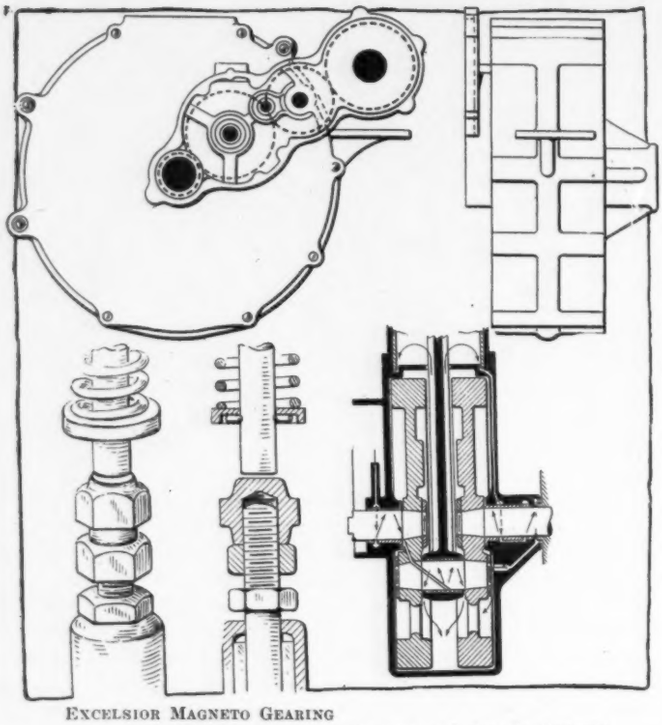
It is expected the Excelsior will attract considerable attention in its home city, Designer Meiser having displayed considerable ingenuity in his work. The adjustable valve tappet, as shown externally and in sections in one of the illustrations, is a little out of the conventional. In this the thrust rod is turned from hexagonal tool steel, leaving a horizontal flange for seizing with a wrench to hold the thrust rod against turning while making an adjustment. The head of the thrust rod is in the form of a cap nut on the upper end of the thrust rod and is held in place by an ordinary lock nut seated between the cap nut and the above-mentioned flange. The magneto that is fitted to the Excelsior is of the Herz high-tension type and is seated on a projecting bracket on the forward side of the crankcase. This bracket is cast integral with the case. Drive is by a chain of gears which are held in an oil-tight housing on the side of the crankcase. Arrangement is made for forcing oil into this housing in such a manner that it is carried along a chain of gears. The form of the housing is such that there are no sharp projections to interfere with the clothing or person of the rider. The Excelsior lubricating scheme employs a positive sight feed oiler delivering the lubricant to the right main shaft bearing, from which point it is carried through the hollow crankshaft to the crank pin bearing. After that it is thrown by centrifugal force to the lower part of the cylinder where a circular pocket gathers it and delivers part of it to the cylinder walls and wrist pin, while the remainder goes through a tubular duct to the left



THIEM WITH TWO-SPEED GEARSET



THIEM IN ITS MODEL E TYPE

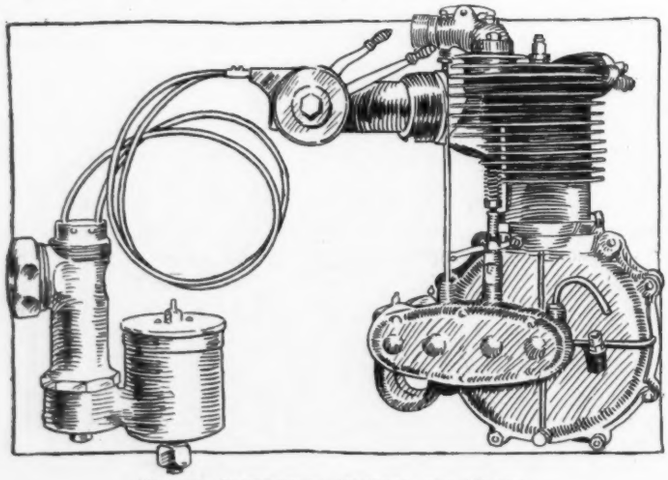


EXCELSIOR MAGNETO GEARING
ADJUSTABLE VALVE TAPPET AND OILING SYSTEM

pletion of the downward stroke, the upward stroke spreads the oil equally over the cylinder wall. Another Excelsior feature is the shock-absorbing spring fork in which provision is made to take up the slighter road irregularities by means of a very flexible spring, while a stronger auxiliary spring looks after the heavy jolts and prevents the plungers coming against a positive stop. To overcome the rebound check springs are used below the plungers. The auxiliary fork is made of heavy gauge tube fitted with a forged bridge yoke carrying two spring plungers, which operate through dust-proof slots. The spring chambers are packed with a solid lubricant.

Hanging of Greyhound Motor

Prominent in the Auto-Bi Greyhound is the manner in which the motor is hung. This is placed very low in order to keep the center gravity low, and its advantage is that the rider does not have to straddle a hot engine and at the same time the air has a chance to blow directly on the head of the engine and thus secure better cooling. The Auto-Bi people also cater to the commercial element by providing a delivery box which can be put on or taken off in a minute. When a stop is made it can be dropped, holding up the machine. This box is designed to carry at least 200 pounds and is regarded as particularly useful for the small merchant who desires quick service.



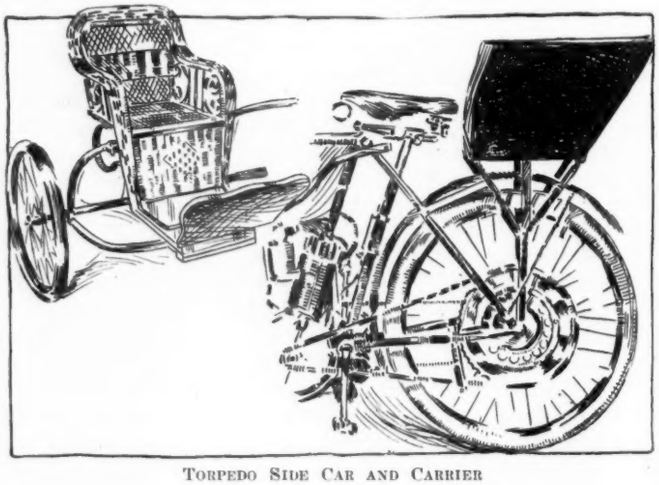
MAGNET CARBURETER CONTROL AND MOTOR

The Hornecker company, showing the Torpedo, has a delivery box which is fastened back of the rider and at the same time does not interfere with his movements. This box attachment was designed for the rural free delivery carriers but it can be used for commercial purposes and also can be fitted to any one of the Torpedo models.

One of the foreign machines whose importer waited for the Chicago show is the Magnet, which comes from Germany. Featured on this two-wheeler is the handle-bar-controlled carbureter. There are two levers on the inside of the handlebar by which the control is effected. One lever controls the throttle while the other is used to secure extra air at high speeds. There are no levers on the tank or frame of the machine and the ignition is controlled by means of a button on the left grip. In the Magnet single-cylinder the inlet valve is mechanically operated and is placed over the exhaust valve, while the cylinder is one-piece and fitted with an explosion head which does away with joints and packings. A slightly tapered pin is used to fasten the piston pin in the piston instead of set screws.

Thor Increases Engine Power

It will be noticed that the Thor people have been satisfied to let well enough alone and have contented themselves with refining their product. Two of the motors are of greater power than before and are new to the line. Valves have been increased in size and to assist in the cooling the exhaust springs have been moved farther from the cylinder. All but one union has been done away with by improving the connection between the dome and the carbureter. In the way of improving the pneumatic cushion fork, which has ball-bearing hinges, the range of action has been doubled and now it is possible to adjust it. In the Thor line there are six models, of which four are single-cylinders and the other twins. In order that magneto ignition may be

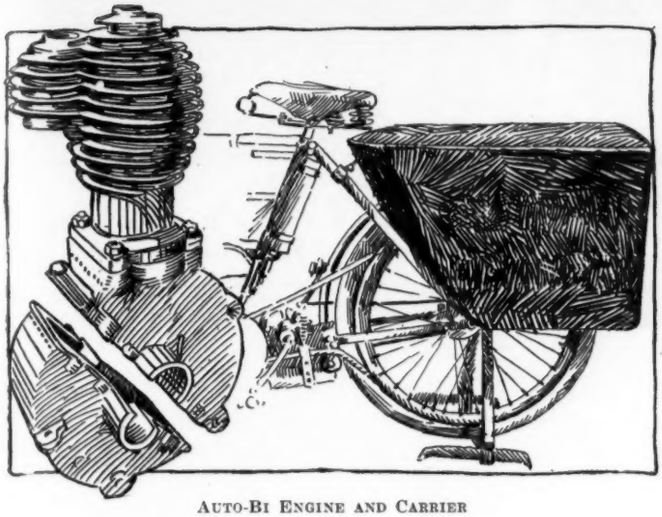


TORPEDO SIDE CAR AND CARRIER

used the Thor people are building an extra engine with a platform cast on the base for the positioning of the magneto. This precaution is taken in order that correct timing may be secured.

Features of the Merkel

The Merkel-Light Motor Co. makes both the Light and the Merkel machines. In the latter division some of the models have the old single bar frame and others the new double loop. This loop design is stiffened by a truss bar over the motor to which the latter is fastened, while the spring frame details have been refined. The spring truss fork is of new triple construction design and a unit with the front wheel, which brings about rigidity in steering and makes the machine easier handled on rough roads. The lubrication of the motor is secured by means of a mechanically-driven force feed oil pump, which is enclosed in the secondary housing and geared to pump so a positive amount of oil enters the crankcase every ninety-six revolutions of the motor regardless of speed. The oil supply can be varied by the setting of an adjustment screw. There is a quantity of oil in the base of the crankcase, the level of which can be seen through a heavy glass window in the side of the crankcase. The supply

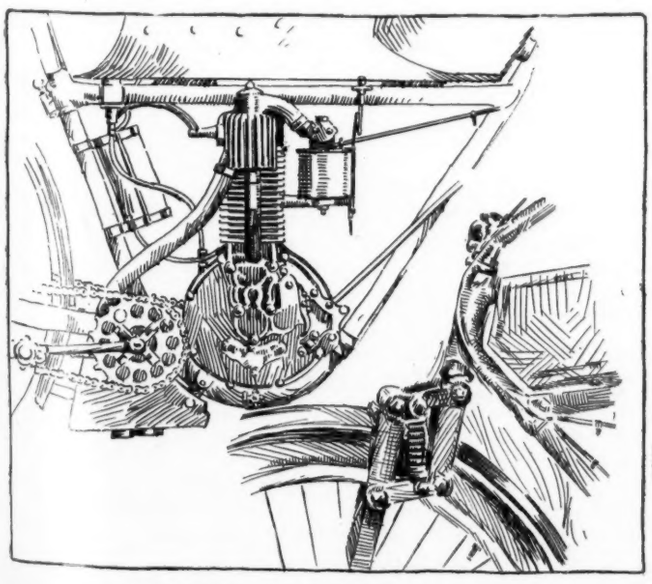


AUTO-BI ENGINE AND CARRIER

is automatically replenished by means of the pump, so all the rider has to do is to keep the supply tank full. In the motor the cylinder and head are cast integral and the flywheel and shafts are forged in one piece. There are automatic intake valves and the large exhaust is operated by a cam made integral with the shaft from a solid bar and having bearings at both ends. The gears are outside the crankcase. All shafts and studs from bell cranks which operate the valves have bearings in both ends in a secondary housing.

M-M Pistons Conical in Shape

The cylinders used on the Marsh-Metz are turned from solid stock and have deep flanges, the cylinder bolts passing through the flanges. The pistons are conical in shape to prevent carbonization at the top and the wrist pin is covered by a projecting ring which does away with set screws, and split pins and stops the wrist pin from working loose. The gears operating the ignition and exhaust cams are drop forgings and include the engine gear, intermediate gear and camshaft gear, all of them being covered by a gear case outside the motor which makes for accessibility. Because of the design of the ignition and exhaust cams, which are one-piece drop forgings, it is possible to secure a long bearing on each end of the camshaft. It is possible to remove the exhaust and inlet valves by loosening one screw. Oiling is secured by means of a force feed pump. The carbureter has a center draught and the jet is adjustable from the top, the needle valve being forced shut by the raising of the float. Additional air is admitted as the throttle opens. With this concern

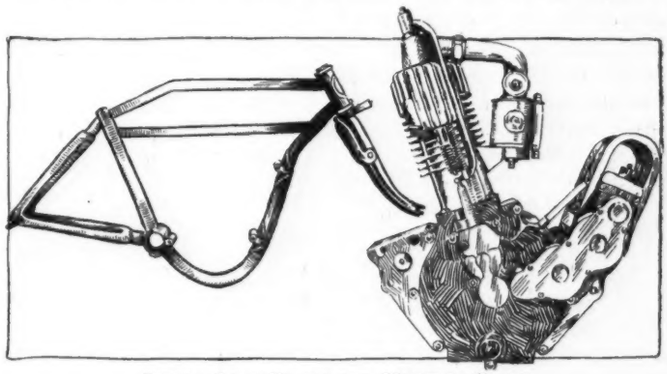


THOR ENGINE MOUNTING AND FRONT FORKS

the oiling proposition on the twin has been given considerable thought. A force feed pump delivers the lubricant direct to the oil reservoir in the crankcase. From there it is thrown out by centrifugal force into each of the cylinders. Belt adjustment may be made and the gear ratio changed by means of an indexed adjustable pulley which has a movable outer flange screwed on the sleeve upon which it travels. The outer flange can be locked by a spring plunger which drops into holes in the pulley.

Lubrication of the Indian

Hendee claims that by changing the design of the motor base in the Indian he has improved the lubrication of the engine, his scheme consisting of an oil pocket in the lowest part of the base into which the flywheel dips and picks up a fresh supply of oil which is thrown forcibly on every moving part by the revolution of the flywheel. Accessibility is another of his claims, it being possible to reach directly every part except the flywheel without removing the motor from the frame. The exhaust pipes and magneto gears are clear of everything and it is possible to take down the cam case in 2 minutes. The magneto rests upon one of the brackets connecting the motor with the frame, which makes it an integral part of the engine. The oil tank, similarly situated, is at the rear of the cylinders. A feature is the exhaust valve lifting mechanism in which a steel disk having cams formed on its two opposite edges and a toothed sector on the upper edge is pivoted by a hardened steel bushing on the projecting end of the bronze camshaft bearing. Then there is a short shaft passing through the cam case and having a bearing in both the cover and body of the case, which carries a crank lever at its outer edge and a pinion on its other end. This pinion gears with the toothed sector on the valve-lifting disk and the lever connects with the usual valve release rod from the grip control. On operating this lever the pinion revolves



INDIAN LOOP FRAME AND MAGNETO GEARS

the disk, causing the cams on its opposite edges to act on the bell crank levers, which lifts the exhaust valves. The new loop frame, which is reinforced throughout by a continuous internal bridge plate of steel in line with the longitudinal lines of the frame, has a top bar which drops to the seat mast tube, thus allowing of a low saddle position.

Reading-Standard Line

The Reading-Standard line for this year consists of four singles, two twins, one twin tri-car and a single-cylinder delivery tricycle. Among the new ideas brought out in a carbureter, which has been redesigned from the one used last year by the Reading company is that of the central draft type, having a single float chamber. Also there is being fitted a spring fork, which is of the compound compensating type, the springs on which are of variable tension. Both chain and belt-drive are utilized and on the former the compensating sprocket is carried on the countershaft, which is found in the rear of the motor. By doing this the designer secures a straight line drive. The old scheme of using two eccentrics to secure an independent chain adjustment is retained. Not much has been done with the engine, the most noticeable change being the stripping of the flanges from the lower half of the cylinder. Head flanges are cast horizontally instead of vertically. Mechanical inlet valves are retained.

Keeping the Car Clean

THE notice of the motor car buyer and user has not heretofore been called particularly to the construction and attachment of dust pans, although this part is of considerable importance. In some cars the dust pan is a component part, and in others it is a fitting or attachment. It goes by a variety of names, like many other parts of the motor car, and is another argument in favor of a committee on the standardization of motor car nomenclature. It is variously called dust pan, mud pan, sod pan, engine boot, drip apron, mud apron, mud shield, chassis apron, and so on.

By whatever name it is known, it is attached underneath the forward end of the car, extending, as a rule, from the front cross member of the frame back as far as the transmission case, and sometimes beyond to afford protection to all working parts, including the front universal joint of the driveshaft. It plays the twofold part of preventing mud and dust from the road being thrown up into the engine compartment and onto the clutch, transmission case and operating levers, and also of preventing oil from the crank and transmission cases dripping onto the garage floor and the street paving.

At First Only Makeshift

A few years ago few cars were provided with permanent mud pans, and as a temporary makeshift aprons of canvas, oiled cloth, leatherette, pantasote or leather were simply stretched loosely under the engine compartment and tied in place. Latterly, however, constructors have been giving more serious attention to this part, and the indications now are that in another year or two there will be little to be desired in this respect. Even now, the almost universal practice is to use a sheet metal dust pan, bolted or attached by special fasteners to the side members of the frame or to the sub-frame. There is even a tendency to go further and, instead of making the dust pan a detachable fitting, some makers are casting their engine crank cases with thin webs, that fill the space between the engine and side frames, which is ordinarily left open, as in the Packard, Mora, Lozier and Stearns. Another method coming into use is to use a pressed steel pan, that is rivited to the lower flange of the side frames and is cut away in the center to allow the motor to set down into it, the pan itself forming the motor support, as, for example, in the Corbin, illustrated in Fig. 1, and the Owen Thomas and Jackson cars.

The material in most general use for dust or mud pans is sheet steel or sheet iron, or from No. 18 to No. 22 gauge, sometimes painted inside and out, and sometimes japanned. Galvanized iron is also used rather extensively, while sheet aluminum of 20 and 22 gauge ranks third in popularity with makers. Among those who use aluminum are White, Moon, Stearns and the Pierce-Arrow. Galvanized iron is used by Knox, Buick, Winton, Dorris, Cadillac, Elmore, Meteor, Pullman and Thomas; while galvanized sheet steel is employed by Brush and Glide. The galvanized iron pan in the Knox cars is corrugated to make it stiffer. Most of the other makers use sheet iron or sheet steel. The Reo people, however, have something distinctive in the use of a special grade of wood fiber, while the Cartercar is using oiled duck, but is considering a change to a metal pan.

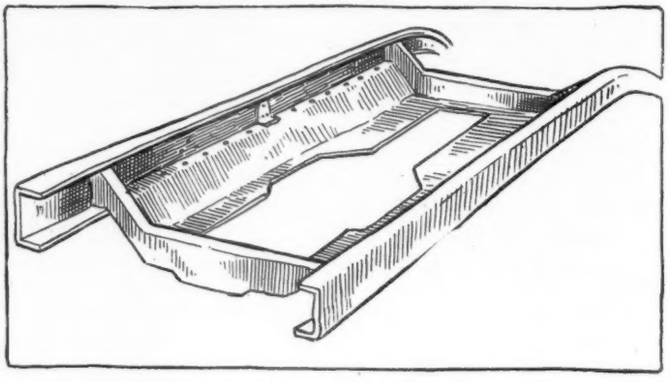


FIG. 1—CORBIN'S STEEL MUD APRON

The dust pan problem is deserving of some study. The shape of the pan and its clearance above the road surface have considerable to do with the amount of dust raised by the passage of the car. Its length and freedom from openings determine the amount of protection it affords to the working parts. Upon the means of attaching depends the facility with which it can be removed and the amount of rattling set up; and whether the pan can be easily cleaned of accumulations of gasoline and oil or not may account for a fire in the engine compartment. Lastly, but of no little importance, is the matter of appearance, in which the size, shape and material of the mud apron cut an important figure.

Show Dust Pans in Sections

Dust pans are made in one, two, three or more parts or sections, and may extend from the front of the radiator to a point beyond the first universal joint at the rear of the transmission, as in the Knox, or to the rear of the countershaft, as in the

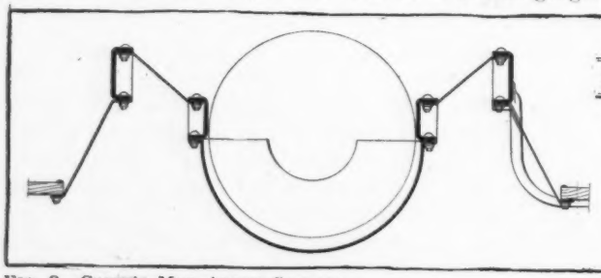


FIG. 2—GLIDE'S MUD APRON SCHEME

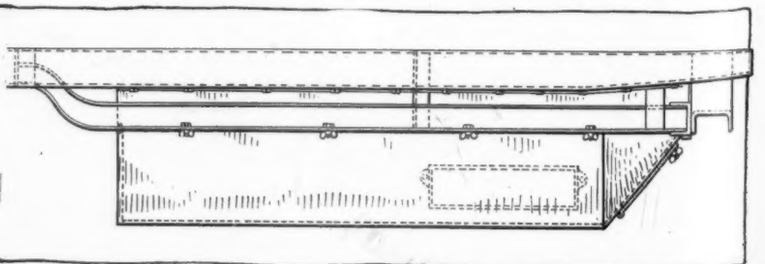


FIG. 3—JACKSON APRON WITH DOOR

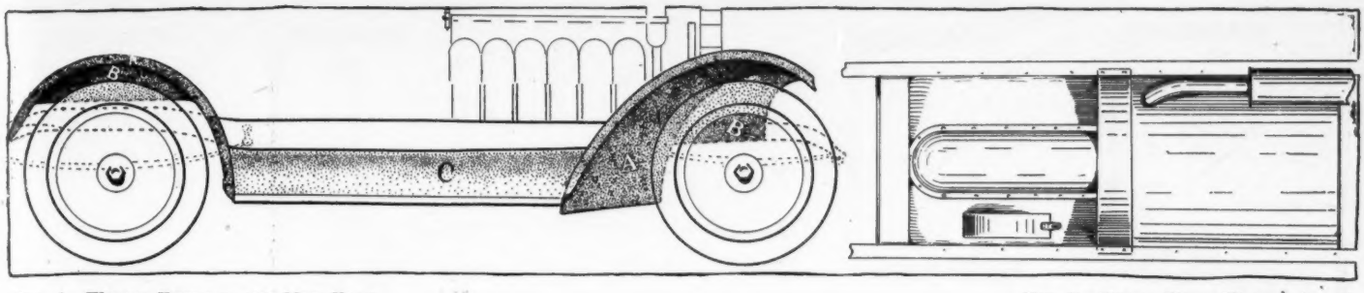


FIG. 4—WELCH FENDERS AND MUD FLAP

FIG. 5—UNDER VIEW WELCH APRON

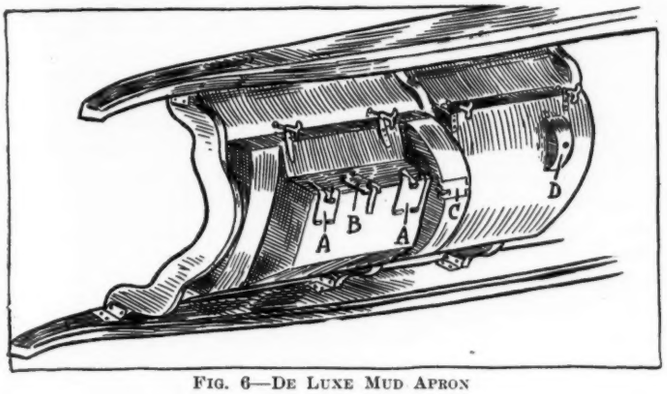


FIG. 6—DE LUXE MUD APRON

E. R. Thomas model F and K cars; or they may extend from the front of the flywheel to the rear of the transmission, as in the Stearns; or again may be merely a drip pan for the clutch, as in the Packard, since the other parts are otherwise protected. In cross section the pans are generally semicircular or made on the arc of a larger circle. In the majority of machines they are attached directly to the lower flange of the main side members of the frame; but in cars having a sub-frame on which the motor is mounted there is a flat sheet to fill the space between the main frame and sub-frame and then a curved drip apron directly under the engine, which is secured to the sub-frame, as in the Glide, shown in cross section in Fig. 2; the model H Jackson, Fig. 3, and the De Luxe, shown in perspective in Fig. 6.

It is becoming customary now not only to protect the under side of the car by means of mud pans, extending from one side member to the other, but to go further and close in the space between the mud fenders and outer side of the frame and between the running board and frame, thus preventing all possibility of mud and water being thrown up into the machinery or splashed against the sides of the car and hood.

Example Seen in the Welch

A good example of this is seen in the Welch construction, shown in Fig. 4, in which the usual fenders A are supplemented by fender aprons B and running board splashers C, which extend the entire length of the running board and are firmly fastened along the upper edge to the frame and along the lower edge to the running board. These parts are made of a good grade of pickled iron. Another good example of this same construction is seen in the Glide, shown in cross section in Fig. 2, in which the method of attachment of the running board splashers is illustrated. The mud apron question has been given serious study by the makers of the Glide cars, and after trying all conceivable kinds they believe that the method used on the 1909 cars has many points of superiority. Although all working parts of the machinery are housed oil tight and dust proof, and need no further protection against entrance of dirt or dripping of oil, yet, for the sake of general cleanliness, the frame is provided with a covering that fits entirely about the engine and leaves only a small portion under the flywheel and clutch. A large and ungainly piece of metal, that is hard to hold and keep from rattling, is dispensed with and access to the machinery for examination and other purposes is rendered quick and easy.

Accessibility Is Desired

Instantaneous removability of the dust pan to give access from below to the under side of the carbureter, oil pump and reservoir and lower portion of the crank chamber is a most desirable feature on certain cars, and is provided for in a variety of ways, often by the use of spring fasteners, that can be released instantly to allow the pan to be lowered to the floor. In some machines, however, special doors are provided in the pan, so that it is not necessary to remove the pan in order to reach the carbureter or other parts. Thus, the pans on the Welch cars have a hinged pocket—Fig. 5—directly under the carbureter, which facilitates removal and adjustment of the carbureter. When closed it is fastened by a hasp and lock. As removal of the rest of the dust pan is unnecessary it is riveted to the frame, but the fender aprons and splashers are bolted on so that they can be removed easily.

Only one side of the pan of the Great Western cars needs to be released from its fastenings, as the other side is hinged to the sub-frame, allowing the pan to be lowered on one side for cleaning and to give access to the underside of the engine and its attachments. This is shown in Fig. 7.

On the Jackson cars, with the exception of model E, access to the inner side of the pan is by means of little doors through which the circulating oiling system can be reached, and there is also a door in the front end. In the model E car, however, the pan fastens directly to the side of the crankcase and is held by the engine bolts, whereas in the other models the pans are secured by means of bolts with wing nuts and spring washers, Fig. 3.

National Pans in Three Parts

National pans are made in three parts, of 24-gauge sheet steel. There is one piece to fill the space on either side of the engine from the crankcase to the frame, a flange being cast all around

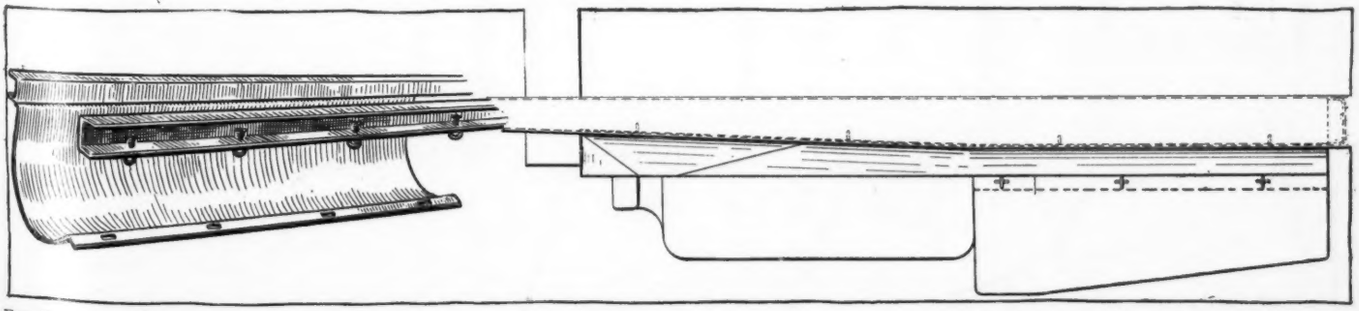


FIG. 7—GREAT WESTERN'S HINGES AT ONE SIDE

FIG. 8—THE NATIONAL APRON BACK FROM MOTOR

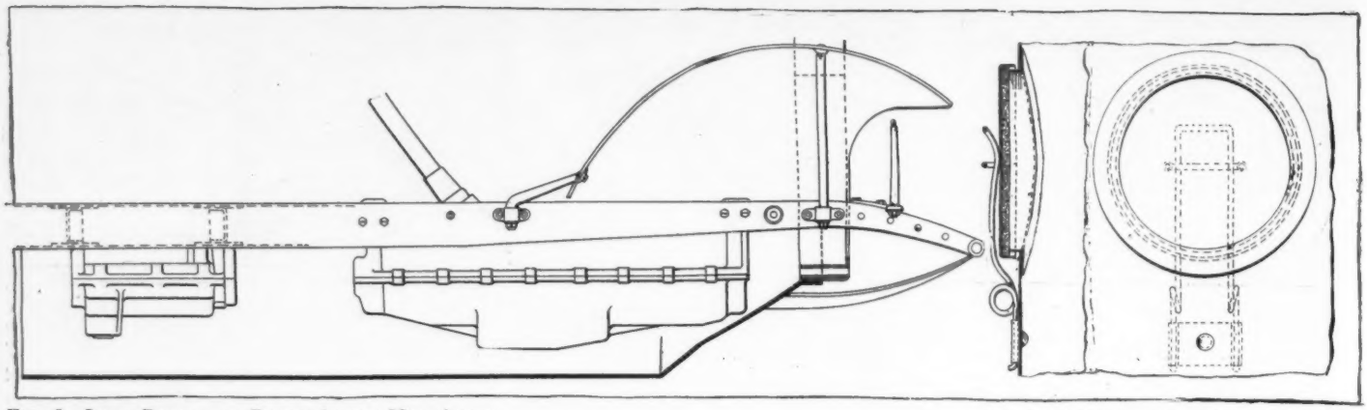


FIG. 9—LONG DESIGN OF PIERCE-ARROW MUD APRON

FIG. 10—DOORS IN POPE-TOLEDO APRONS

the crankcase for the pans to come up against. Then there is a tapered portion—see Fig. 8—of nearly semicircular section which is attached under the flywheel and extends rearwardly under the transmission. The edges of this part have wire rolled in them so that they will hold their shape—a practice that is somewhat general—and are held in place by spring fasteners such as are used to hold engine hoods down securely.

A longitudinal section of the Pierce-Arrow mud pan is shown in Fig. 9. It is a good example of the perfect protection afforded to all working parts.

In the Olds cars the dust pan proper is bolted to the sub-frame, filler plates A being riveted to the lower flanges of the side frames and sub-frame members, which are in the same plane. There is, however, a removable section or door in the pan—Fig. 11—which is provided with a handle B on either side and is secured in position by means of two special fasteners with cam lever locks C on each side. These can be released by a single movement of the hand.

De Luxe Motor Parts

The De Luxe system has a number of characteristics that are of interest. As shown in the perspective drawing, Fig. 6, it is made in two parts, one extending from the radiator to the rear of the flywheel and the other from the flywheel to the frame cross member back of the gear box. Each section is independent of the other, and is instantly removable. Trap doors AA are provided on the bottom of the engine pan, so that the drain cocks are readily accessible, and on the side of this pan is a small hinged inspection door B for inspection of the bulls'-eye on the crankcase oil reservoir. In the depression under the flywheel is a trap door C to permit of easy cleaning and also to make it easy to recover small articles sometimes dropped by accident. There is a similar door D near the end of the pan under the gear box. The pans proper are secured to the sub-frame by special spring fasteners, described further on.

A one-piece mud apron is used on the Pope-Toledo and is peculiar in having no mechanical fastening. The edges of the sheet steel are rolled with a groove so that the edges can hook over the inner edge of the inverted box truss frame, being prevented from rattling by a felt lining. The entire apron can be unhooked and dropped to the ground in a few minutes; yet, in addition to this, unusual accessibility is provided by means of one 15¼-inch and one 6-inch door on the right side, and five circular hand holes along the center line of the pan. These handholes are closed by metal caps with flanged edges and lined inside, Fig. 10. They are held closed by wire springs.

Attaching the Mud Pans

Turning attention now to the means of attaching mud pans, we find a variety of methods in use. The Pope-Toledo is the simplest, but cannot be used generally because few builders use the inverted channel frame, so that there is no edge over which the rolled edge of the pan could hook. The next simplest method is the plain bolt and nut, by which the edge of the pan is held against the under side of the lower flange of the frame, as in the White, Fig. 12, and Packard, Fig. 13. Leather straps and buckles are used by several makers, including the York company and the Austin. As before stated, some few builders rivet the pans permanently to the frames where there is no occasion to get at the under side of the motor.

In the Moon car an inverted bolt with slotted head is used, Fig. 14, and a lock washer A and wrought iron washer D are employed to prevent the nut working loose and the bolt head from cutting into the edge of the pan.

Most builders stiffen the edges of the pan, either by rolling them over a wire or using a separate strip of heavier iron placed between the edge of the pan and the bolt heads or nuts. About the simplest form of this is seen in the Haynes, Fig. 15, in which the edge of the pan is held between the frame flange and a flat strip A of ⅛-inch iron ⅞ inch wide. Spring washers B prevent the nuts from working off of the bolts. The Rider-Lewis construction is practically the same, A and B in Fig. 16 representing respectively the stiffening strip and lock washer, while a wing nut takes the place of the plain nut. The steel strap or stiffener is slotted laterally, however, at each hole, so that when the thumb nuts are loosened the pan may be pushed inward and dropped.

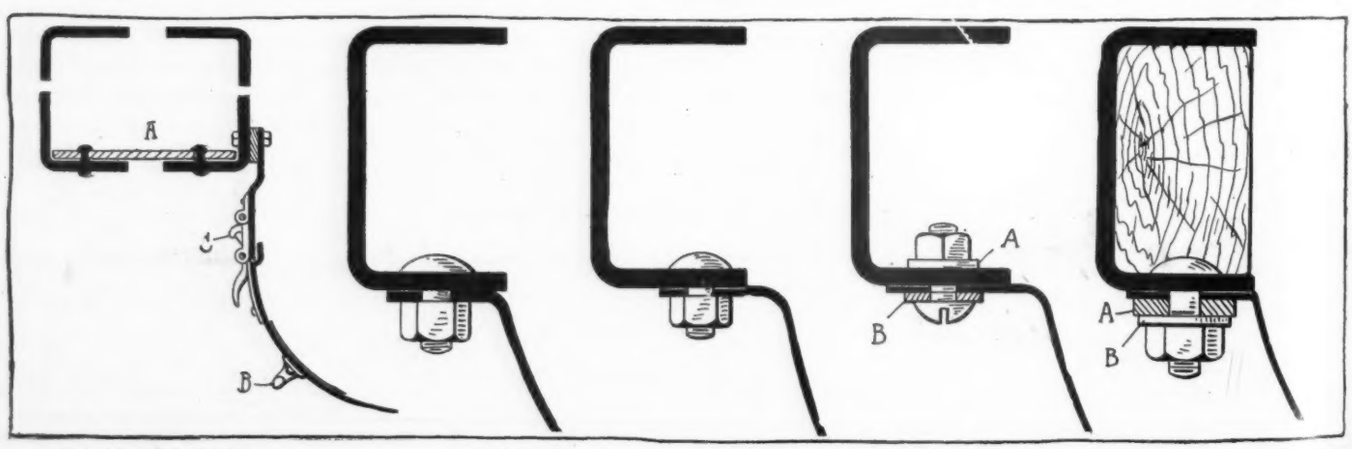


FIG. 11—OLDSMOBILE FIG. 12—WHITE FIG. 13—PACKARD FIG. 14—MOON FIG. 15—HAYNES

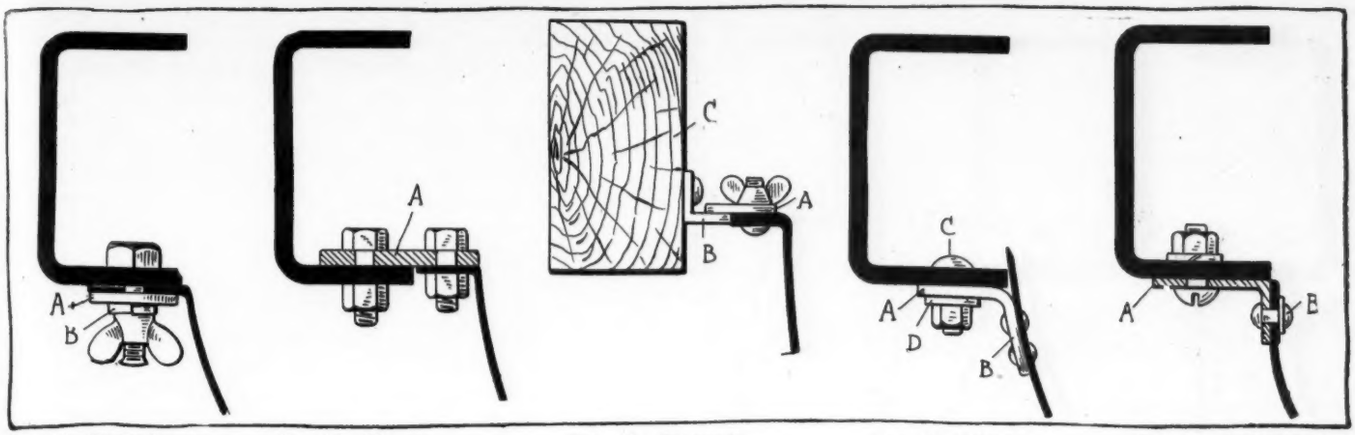


FIG. 16—RIDER-LEWIS FIG. 17—METEOR FIG. 18—FRANKLIN FIG. 19—PIERCE FIG. 20—LOCOMOBILE

The value of the mechanical fastener, no matter what the nature of it, is in the time saved and also because it is possible to clean an apron of this nature once in every few months and so avoid the danger of fire and aid in keeping the car in shape.

Method of the Meteor.

Instead of bringing the edge of the pan flat up against the flange of the frame the Meteor people employ two flat strips of iron, ½ to 2 inches, which are bolted to the upper side of the lower frame flange—Fig. 17—and the edges of the pan are then brought up and held to the other edge of the strips by a different set of bolts.

In the Franklin cars, which have wood frames, the pan is held to a stiff strip of flat iron A, Fig. 18, by bolts and wing nuts, and the outer edge of this strip simply rests on the flange of a length of angle steel B secured against the inner side of the wood frame member C.

George N. Pierce uses an angle steel strip A, Fig. 19, which is riveted to the edge of the pan at B and held to the frame by slot-headed bolts, the nuts of which are held from working loose by lock washers. The Locomobile system is quite similar, a bent strip of iron or steel A, Fig. 20, being riveted at B to the side of the pan and held against the lower side of the frame flange by studs riveted in the frame, and nuts and washers D.

Winton goes further and rolls the edge of the pan over the stiffening strip A, as shown at B in Fig. 21. The stiffened edge is then held against the bottom of the lower flange of the frame by the usual bolts, nuts and lock washers. The Cadillac pan also has a folded over edge to reinforce the pan and at the same time present a smooth edge along the outside of the frame. The openings in the pan around the spring shackles and steering gear are as small as is consistent with free movements of these parts.

No special attaching means is required for the pan in the Mora cars, since the pan A, Fig. 22, is cast integral with the aluminum base B of the engine. The power plant is assembled as a unit and is bolted to the wood-filled frame by large lateral bolts and held by castellated nuts C, that are kept from working off by split pins.

Fastening Methods on Thomas.

Two different fastening methods are used on the Thomas cars. On model L, as shown in Fig. 23, a special clamp A, formed with a web, is riveted to the frame at B. The flattened portion has a bearing on the flange of the frame and the edge of the pan is secured to it by cap screws C and wing nuts. Spring washers D prevent loosening of the nuts. The clamps A are adjustable within a small range. In models F and K the construction shown in Fig. 23a is used. Here a special stiffening ledge A is used and is bolted against the under side of the frame flange. Square headed bolts C are inserted at intervals through the edge of the ledge A and are held against turning or dropping out by special clips B, that enclose the bolt heads and are riveted to the ledge. The edge of the apron is brought up and engaged with the ends of bolts C, where it is held by wing nuts and washers.

The unusual method of attaching the Rambler pan is shown in Fig. 24, in which A is a rolled strip riveted to the edge of the pan and held within the channel of the frame by bolts B and nuts C.

Nordyke & Marmon have a special hinge fastening with slip pin like a door hinge. Two parts A, Fig. 25, are riveted to the edge of the pan and an intermediate part B is riveted to the frame. The bolt or pin C is then inserted from one end. This construction permits of either side of the pan being dropped down on the hinges of the other side.

A number of quick detachable methods utilizing spring fasteners are employed by different manufacturers. One of the simplest is the Stoddard-Dayton, Fig. 26. Rivet eyes A are attached to the sides of the pan and the ends of extension springs B inserted in them. The other ends of the springs are hooked over clasps

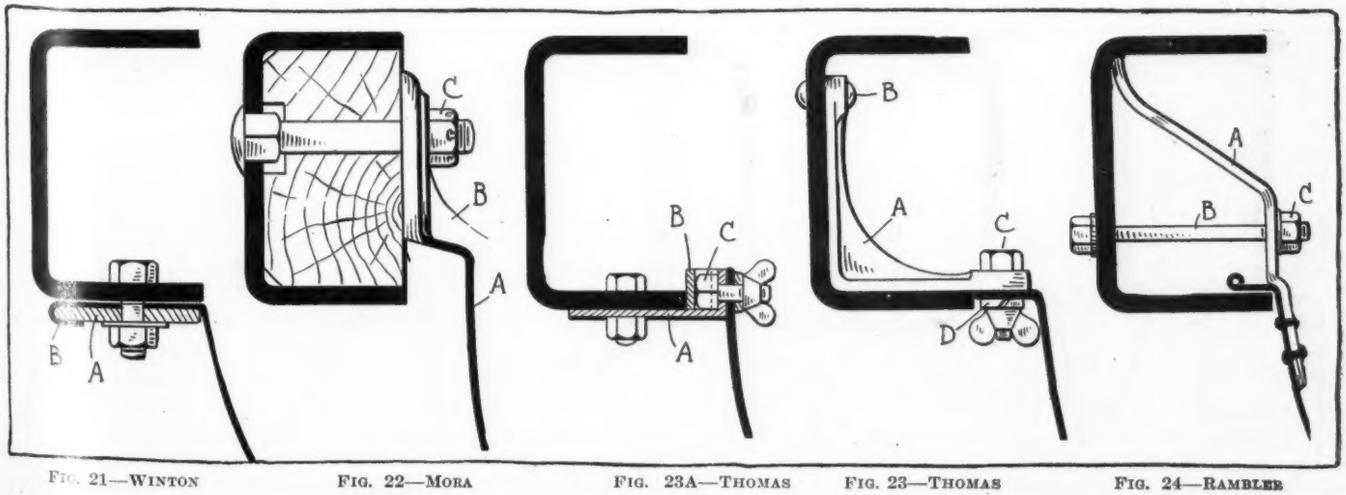


FIG. 21—WINTON FIG. 22—MORA FIG. 23A—THOMAS FIG. 23—THOMAS FIG. 24—RAMBLER

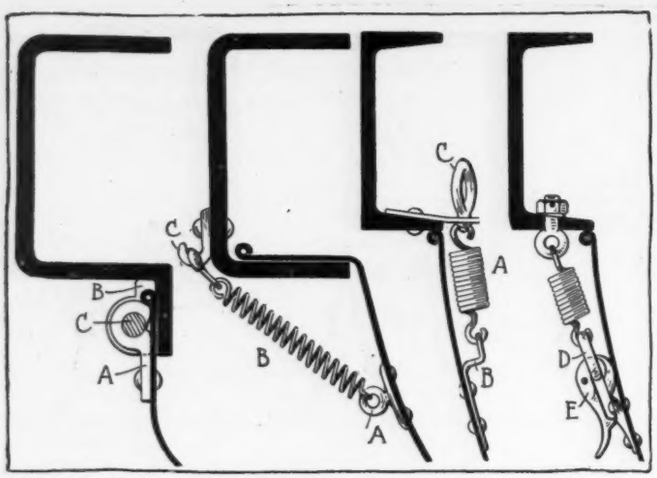


FIG. 25—MARMON FIG. 26—STODDARD FIG. 27—KNOX

C, which are riveted to the side of the frame. The rolled edge of the pan is sprung into the channel of the frame. Usually only three fastenings are required on each side of the mud pan, and in some cars, as the Stevens-Duryea, there are but four fastenings in all, placed at the corners.

Quick Detachable Spring Fasteners

Two styles of quick detachable spring fasteners are used on the Model O Knox, as in Fig. 27. One style is used at the forward end and the other at the rear, the pan being made all in one piece, reaching to the rear end of the transmission and being held by eight fastenings. In one style an extension spring A engages an eye B riveted to the inside of the pan and at its other end has a ring C which engages in a depression formed in a slotted plate riveted to the frame flange. An upward pull with the finger in the ring disengages it from the depression, when it can be slipped out of the slot, freeing the edge of the pan. This, it will be noted, is an internal fastening. The other is an outside fastening and is employed at the rear part of the pan, where it can be most easily reached underneath the frame. The ring D engages a cam clasp E which can be freed instantly by an outward pull on the curved end.

The Buick and Chalmers-Detroit methods are nearly identical. In the Buick, Fig. 28, the rolled edge of the pan engages the frame flange and is held by pins A, which are retained in position by compression springs. Finger loops B are formed in the pins, whose free ends C engage in holes bored in the side of the frame. In the Chalmers-Detroit, Fig. 29, the pins B are formed with large rings C for the finger and hooks D to engage holes in the frame.

Spring Latch Is Reversed

The position of the spring latch is reversed in the Midland, Fig. 30, the spring C being inside of the frame channel where it is not in the way and cannot be broken. The lower end of the bolt is formed into a ring D for the finger and a hook B, which catches under the turned-over edge A of the pan and holds it tightly against the frame.

Still another form of latch is found on the De Luxe, Fig. 31. The latch is hinged at A in an angle plate riveted to the outside of the frame. At B is a notched lug riveted to the edge of the pan. At C the latch engages the notch and is held there by an internal compression spring D. A downward pull on the latch releases it from the notch, and, the lug being slotted, it can then be swung outward to release the pan.

No Spring Used by Premier

No spring is used in the Premier, Fig. 32, in which a slotted lug A, riveted to the pan, is engaged by a wing nut on the end of a bolt B that is hooked at its other end to engage a hole in a plate C riveted to the upper flange of the frame. A slot is cut in the lower flange at the point where the bolt passes through, so that when the nut is loosened the bolt can be swung back to free it from the lug.

Mitchell Uses Hood Hooks

Quick detachability, together with firm seating when attached, is a mud apron problem that has been worked by the makers of the Mitchell. The solution is a key such as used to fasten the hood down. The Mitchell's apron is of sheet iron and extends from the front of the hood clear back to the transmission gear case. Toward the front and rear of the upper edges of the apron, and within easy reach under the hood, are angle irons riveted to the inner surface of the apron and set opposite each other on either side of the engine. Bolted to the horizontal arms of these angle irons are the keys, which lock into the slots in hook-shaped claws bolted to the upper side of the sub-frame and are held firmly in place by strong spiral springs, like the keys that lock the hood. The springs prevent rattling. Simply lifting and turning these four keys drops the apron and exposes all the under side of the mechanism, enabling access for oiling or repairs.

From the foregoing it can be seen that there are many points to consider in the design and construction of mud pans and their attachment. Eventually this part of the motor car may be done away with altogether by the use of pressed steel supports for the motor and webs cast integrally with the crankcase, but until that time the buyer and user of motor cars will be pleased to know that every effort is being made to eliminate the defects of the dust pan or mud apron.

The importance of mud aprons is proven by discussions that have already arisen relative to the penalization of these on the Glidden tour 1909. Makers realize that it will be particularly hard on them on this tour and not a few replacements may be needed. On the New York-Paris run one contestant changed aprons nearly every week, one change alone costing $30. When an hour is lost on a repair it is a loss of 60 minutes, whether occasioned by ignition, carburation or mud aprons, and it often happens that repairs for mud aprons cost more in time and money than those for more intricate and vital parts of the car.

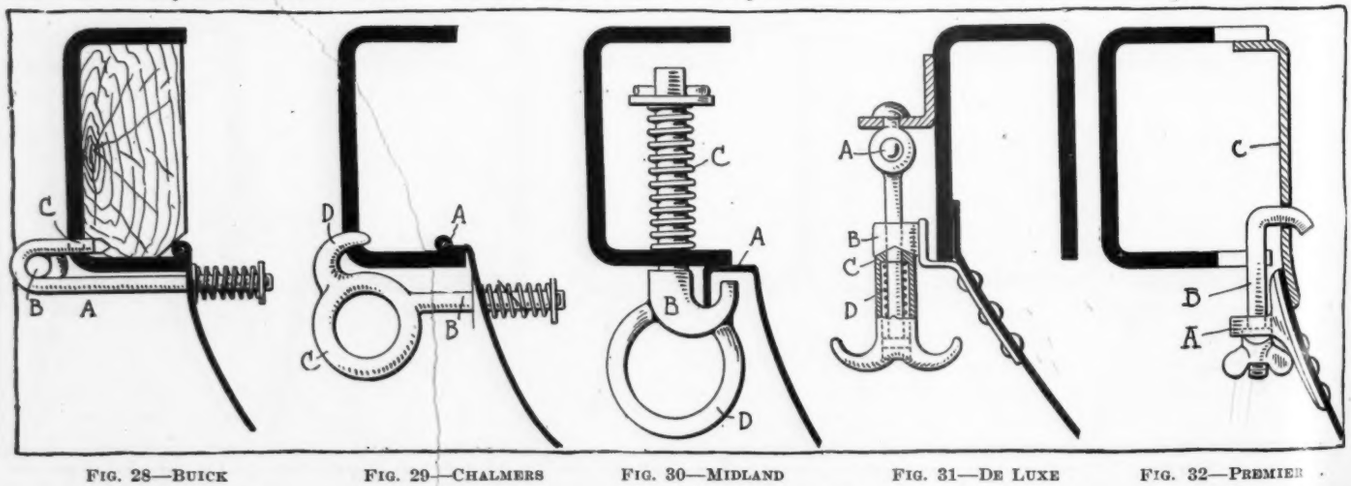


FIG. 28—BUICK FIG. 29—CHALMERS FIG. 30—MIDLAND FIG. 31—DE LUXE FIG. 32—PREMIER

Baggage Facilities

THE constantly increasing interest in touring calls special attention to the subject of adequate provision for the carrying of luggage, tools and the miscellaneous articles necessary to the convenience and comfort of the passengers. Vast improvement has been made in this direction since the days of the little, cramped, rear-entrance tonneau cars of 5 years ago. Even with the very roomy tonneaux of today, however, the carrying of suit cases in the tonneau usually subjects the passengers to inconvenience, and to strap them upon the running board means that they will be splashed with mud and water and scratched and rubbed to an extent that will prove their ruin in the course of a few long trips. Ordinary suit cases hardly offer sufficient space for the luggage of a touring party of four or more, and most motor car makers now equip their touring cars with folding trunk racks at the rear on which can be strapped the specially built trunks that are dust and water proof as well as strong and durable.

Providing Luggage Space

In addition to the personal clothing required by each member of a touring party, there are numerous other articles pertaining principally to the car that must be carried, such as storm aprons, robes, waterproof coats, jumpers, gloves, tools, cans of oil and grease, and so on. Special provision must be made for the storage of these in accessible places, so that it will not be necessary to disturb all the passengers when it is required to get at them, as used to be the case when all such articles were crammed into the spaces below the seats through openings under the seat cushions. The largest available storage space in touring cars is, of course, under the rear seat, but it is now the common practice to construct hinged doors at the rear end of the body through which this space can be reached. Machines in which the fuel tank is hung under the rear end of the frame leave the entire space under the front seats also available for storage purposes, greatly increasing the luggage-carrying capacity of the car.

Batteries and tool boxes, which in earlier days were usually carried inside the car body under the seats, are now generally attached to the running boards, the battery box usually on the right side and the tool box on the left side of the driver's seat. There are, however, numerous corners or nooks about a car that would be merely waste space if makers did not recognize the requirements of motorists for small compartments in which goggles, gloves, veils, and so on, can be placed handily. Such a space exists, for example, between the two front bucket seats, and by several makers, as the Packard, Knox, Welch and others, is closed in and upholstered to form pockets of surprising capacity.

Carrying Spare Tires

Spare tires, which can hardly be considered as baggage yet are an essential article to be carried on trips of any length, are almost universally carried on the running board, except on runabouts or cross-country cars, where they are frequently strapped on the rear end. A very unusual and ingenious disposition of the spare tire is made by the builders of the Rider-Lewis car. The tire is crowded into the channel of the frame directly over the rear axle, as shown in Fig. 1, flat steel arms being swung inward, to which the tire is strapped. In this position the tire is carried safely and at the same time is inconspicuous and out of the way when entering and leaving the driver's seat. The conventional folding trunk rack and luggage carrier at the rear of the frame is provided also.

A special luggage compartment is provided on the Franklin 42-horsepower runabout, whether fitted with single or double rumble seat. This is shown open in Fig. 2. There is a large space under the seats for suit cases, which is made practically dustproof. A curved lid, hinged along the lower edge and held by leather-covered chains on the ends, closes the storage box, leaving space for small packages, satchels, coats, etc. When it is desired to carry a trunk the lid is lowered to a horizontal position, as shown, and the bottom of the trunk sits on a metal rack that prevents breakage and marring of the finish of the lid. On all models of the Franklin touring cars there is a space beneath the rear seat for the storage of top curtains and blankets or other articles, and on the 28-horsepower model there is a tilting equipment for the pump, jack and other tools. This is beneath the front seat and opens into the tonneau. The larger model touring car has a large tool box on the running board. In all models there are two tool drawers beneath the fuel tank under the front seat—a feature that is also found in the Knox car.

Baggage Facilities on the Marmon

Four large suit cases or a small steamer trunk can be carried in the baggage compartment of the Marmon 50-horsepower tourist, which has a surrey rear seat. This space is shown in Fig. 3, with the rear door open. Three strong hinges hold the door at the bottom, but in order to make the space absolutely dustproof the edges of the door come up against rubber packing and there are ten special fasteners that draw it up to a tight fit. The whole interior of the compartment is lined with canvas. A Yale lock prevents possible theft of the contents.

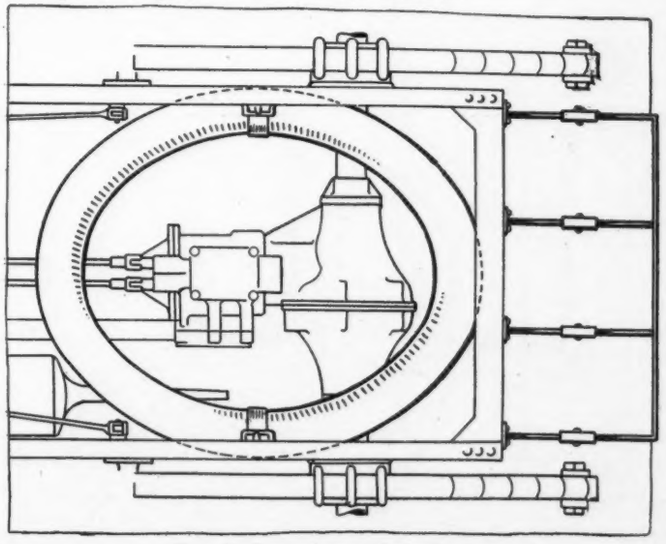


FIG. 1—RIDER-LEWIS TIRE CARRIER

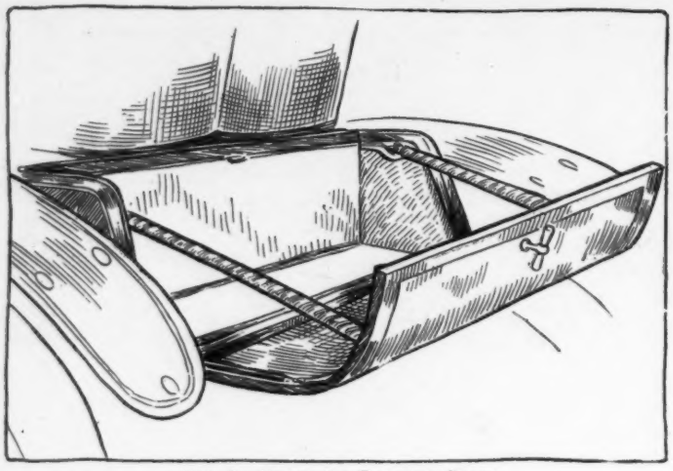


FIG. 2—FRANKLIN BAGGAGE SPACE

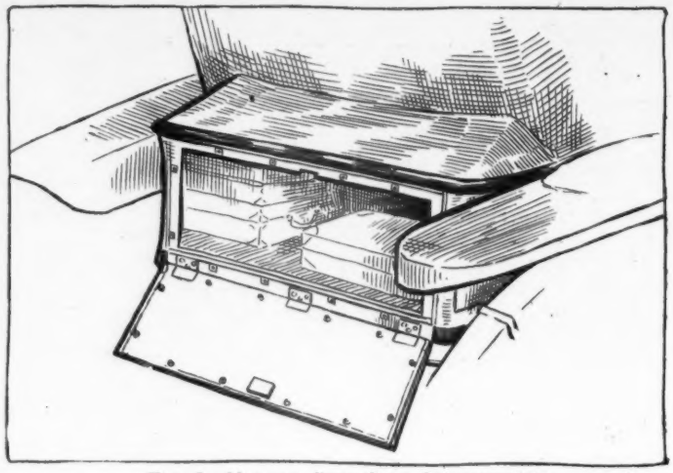


FIG. 3—MARMON SUIT CASE COMPARTMENT

Space under the front seat in the Pope-Toledo cars is made available for luggage-carrying and is fitted with special sole-leather suit cases which are accessible from the tonneau, as shown in Fig. 4. A leather flap hangs from the rear of the seat, concealing the suit case from sight. All of the tools and equipment necessary for the repairing of the car are carried in steel boxes on the running boards, leaving unusually ample space for the personal effects of the passengers.

Makers of the Mora cars have given especial attention to the luggage question, and have even gone to the extent of regularly equipping a touring trunk on the body platform of the light four tourer, the light six roadster model and just back of the seats of the racytype or cross-country car. These trunks are of special waterproof make, held in place by two large straps attached to the trunk and passed through brass loops on the platform. In the light four-cylinder model the trunk fits part way under the rear of the back seats, as shown in Fig. 5. A trunk similar to a small steamer trunk is placed on the rear platform of the six-cylinder racytype model and is held by heavy straps attached to the platform which pass over the trunk. The platform also has a brass rail to give a finished appearance. On this model the space which the trunk ordinarily occupies may be utilized for a rumble seat and a folding trunk rack attached to the frame, as on the light six tourer.

Space Under Front Seat on Welch

The Welch is one of the cars in which the space under the front seat is made available by the placing of the fuel tank under the rear end of the frame, thus greatly increasing the luggage space. Every Welch car carries a pair of duplicate boxes on the running boards, one for the battery and the other for the tools, illustrated in Fig. 6. These are 9 inches deep, 9 inches wide and 20 inches long, and provide ample room for the batteries and the complete set of tools. They are of substantial construction and in place of the ordinary sheet metal cover have an aluminum cover which is light but strong and has a pyramid surface which can be used as a step without danger of slipping.

An artillery box is fitted on the rear deck of the Welch runabout. The center space provides a base for the rumble seat, and on either side is a lid opening into the storage compartment, as shown in Fig. 7. Almost concealed in the upholstery between the two front seats of the Welch cars is a handy little box 8 inches long, 3 inches wide and 4 inches deep, which is useful as a receptacle for gloves, cotton waste, spark plugs and similar articles.

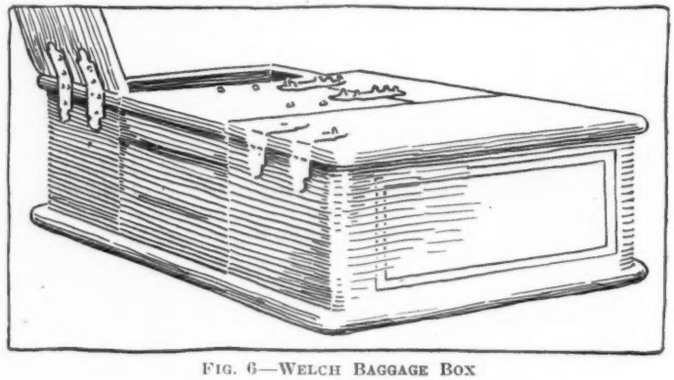


FIG. 6—WELCH BAGGAGE BOX

Space in the backs of the front seats that is otherwise useless is made available by the Packard people for convenient deposit of small articles in the manner illustrated in Fig. 8. There is a sort of triangular-shaped pocket at the back of and between the seats closed by a leather covering that extends all the way across the seat backs to prevent scratching of the paint by suit cases, umbrellas or other articles carried in the tonneau. Access to the pocket is by means of a semicircular flap held down by button latches. Below this pocket and extending all the way

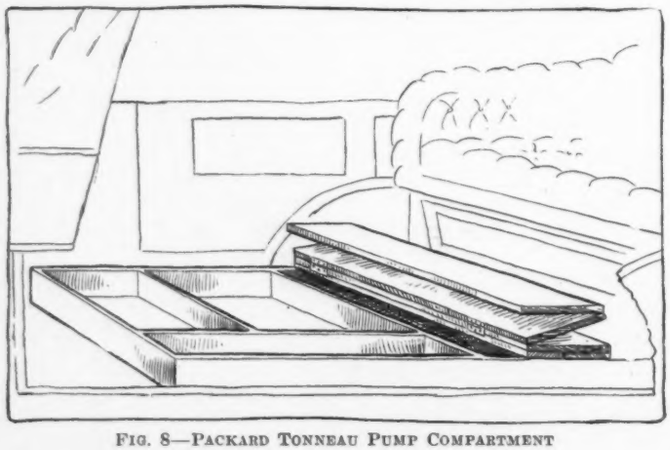


FIG. 8—PACKARD TONNEAU PUMP COMPARTMENT

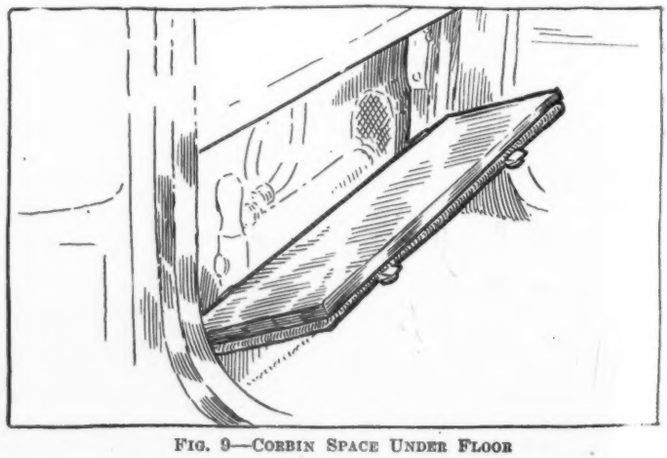


FIG. 9—CORBIN SPACE UNDER FLOOR

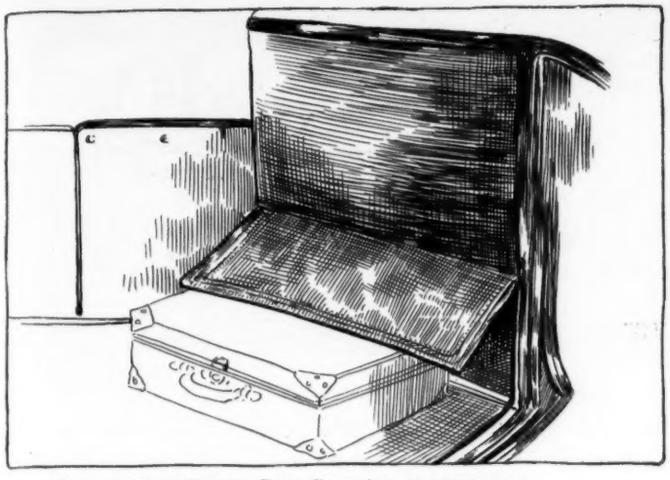


FIG. 4—POPE-TOLEDO SUIT CASE ACCOMMODATION

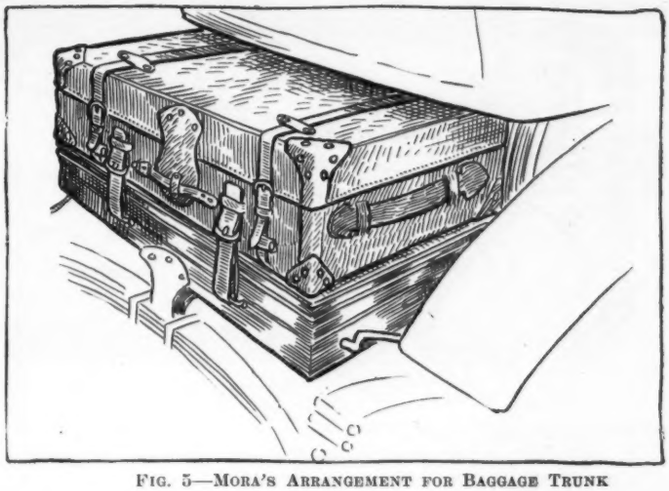


FIG. 5—MORA'S ARRANGEMENT FOR BAGGAGE TRUNK

across the body is a narrow compartment with hinged door in which the tire pump is carried. A special feature of the pockets in the doors of the Packard cars is that the doors themselves are recessed to form box-like compartments covered by the leather upholstering, in which goggles and other breakable articles can be carried without danger of being crushed. Rattling of the tools in the tool-box is prevented by forming the trays out of thick wood which is recessed to the shape of the various tools so that they cannot come into contact with one another. Under the tray is space for the jack, tire chains and inner tubes.

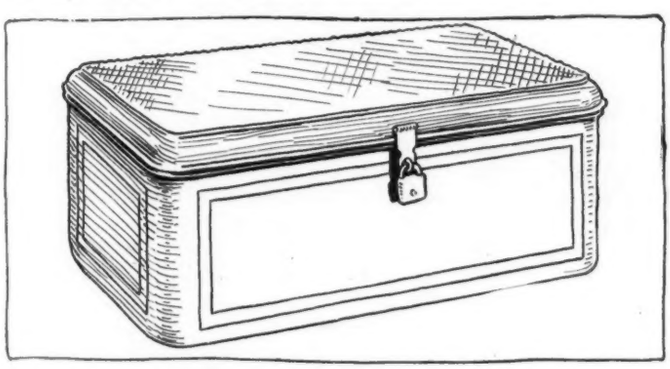


FIG. 7—WELCH BAGGAGE BOX

A most ingenious disposition is made of the tools in the Corbin cars. The floor of the tonneau is built with a false bottom and is provided with floor boards that fold back, as shown in Fig. 9, exposing shallow compartments of various shapes and sizes. In these the tools can be arranged in the way most convenient, those which are in most frequent use being placed in the spaces nearest the front where it will not be necessary to disturb the passengers to remove and replace them. Besides freeing the running boards of the incumbrance and weight of a tool box, this arrangement raises the passengers in the tonneau slightly above the occupants of the front seats, giving them a freer view of the road ahead. At least one maker forms a tool box under the full length of the running boards, dividing it into several drawers.

Under the rear seat of the Pierce-Arrow touring cars, Fig. 10, is a baggage space measuring 35 inches long, 10 inches high and 11½ inches deep from front to back. Directly below this is hung a box in which the jack, cans of oil, grease and carbide, and wads of cotton waste can be carried. The inside measurements of this box are 31 by 10 by 7½ inches. The space under the rear seat, and the box also, have doors that open from the rear. The customary folding trunk rack is also provided, on which a motor trunk or several suit cases can be carried. The two extra seats in the seven-passenger car are removable, and if there is fewer than the full number of passengers on a long tour one of the seats can be taken out and several suit cases placed in the tonneau against the left door, where they can be strapped together and will not be in the way of the occupants of the tonneau, who can use the right door for entering and leaving the car. Like the Thomas and several other cars having pressed metal dashes, the Pierce-Arrow has a pair of dash cabinets that are partially concealed by the curved edges of the dash.

Unusual Feature on the National

In the National cars the space under the rear seat is accessible both through a rear door and by a removable cover or lid under the seat cushion, as shown in Fig. 11. An unusual feature is the construction of two narrow compartments or pockets under the front edge of the rear seat, which open forward.

The Reo touring car can be converted easily into a roadster by unfastening three thumb-screws, lifting out the tonneau and substituting a touring box on the rear deck. The tool box in all Reo models hangs under the right hand front seat.

All the space under both the front and rear seats is available for luggage and storage purposes in the Lozier cars and the Gaeth tourabout.

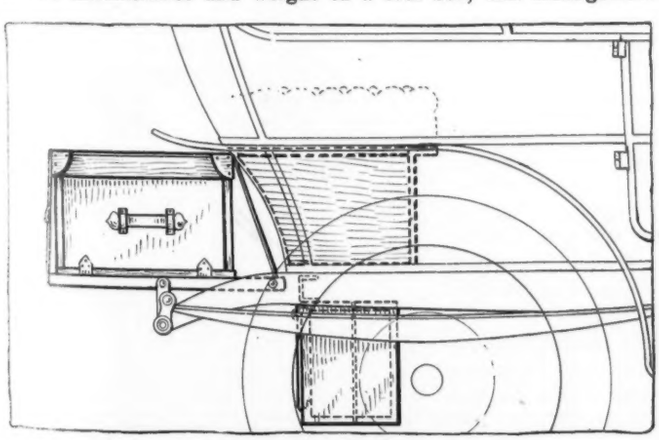


FIG. 10—PIERCE BAGGAGE COMPARTMENTS

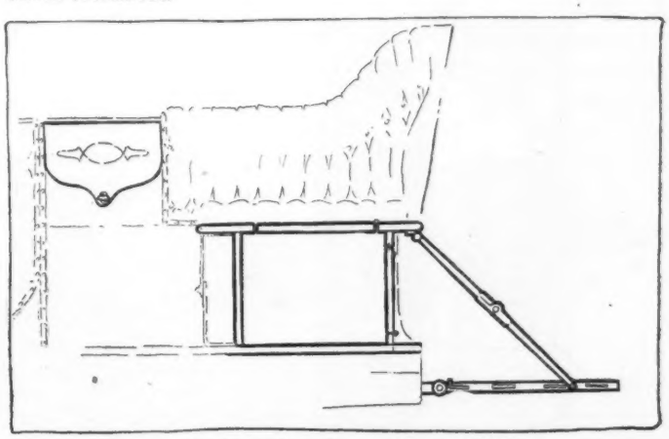


FIG. 11—NATIONAL BAGGAGE ARRANGEMENTS

The Accessories

SUNDRIES always have occupied a big place in every Chicago motor car exhibition and the display for next week's event will eclipse all previous efforts. As usual the accessories of all types will be distributed in many places. A big percentage will be in the immense rectangular gallery overlooking from four sides the main floor of the Coliseum. To the south end the basement and gallery of the annex will be generally devoted to them and the gallery in the armory will be needed. With all of this space scores of exhibitors who have applied for space have been turned away. In many of the accessory booths features not seen at either of the New York shows will be displayed. Added to these novelties will be the vast array of western and central makers who did not journey to the New York show, and who will reveal their lines to the public at the show for the first time. The versatility of design that has always characterized accessory exhibits will not be wanting next week. In tires many improvements can be found, in electric apparatus several innovations will be met with, and in the lamp field improvements must not be overlooked. In fact, in every one of the 100 accessory departments changes are constantly taking place, the makers straining every nerve to keep pace with car design if not to set a faster pace than the car builders have.

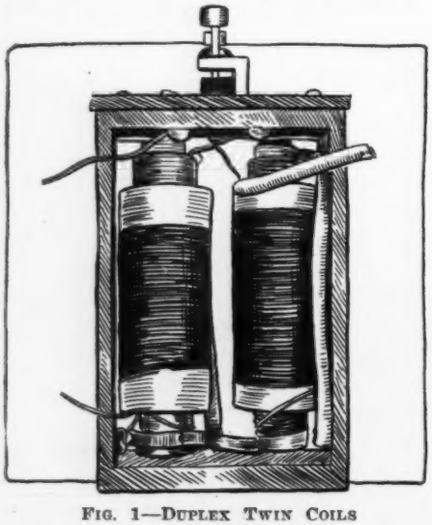


FIG. 1—DUPLEX TWIN COILS

Limousine-Carriage Mfg. Co.—This concern will exhibit its three styles of windshields, designated Voltz, Schildback and Beecher. A new feature on the Voltz is a cross-channel secured to the bottom of the top half of the shield so that when it is mounted vertically over the lower part this channel rests firmly over the latter and a finger wheel securely locks it in position. This is the first example of this type Motor Age is aware of and it should give a water-tight joint as well as one capable of holding the shield rigidly in the up position. This shield is braced from the front by rods angling to the side members of the frame. Another type of windshield made by this concern is the Beecher, on which a new locking device is used to hold the upper half rigid when in an upright position. The glass shield is also made to stand at 45 degrees and 60 degrees angles for roadster cars. The Schildback shield is one of the oldest types made by the company and is of the hinged variety.

Eugene Arnstein—Arnstein is the sole distributor for the Century exhaust horn, which is of the four-tone type, small and compact and guaranteed to blow on either high or low speeds. Another feature of his line is the Bean gasoline gauge, which, in construction, is very similar to the Webster gauge. It is made adjustable to fit the various size tanks and equipped with a steel dial. Arnstein also has the Chicago agency for Pick-up ratchet wrenches, which are put up in sets with sockets, very much like the Auto Cle. These articles will all be displayed at the show, along with a full line of accessories.

Globe Machine and Stamping Co.—Metal work that has been applied to motoring purposes will make up the display of the Globe Machine and Stamping Co., which intends showing such things as steel tool and battery boxes, foot rests, robe rails, handles, brake drums, parts and stamping. Since the practice of placing storage batteries and dry cells on the running board instead of under the seat became popular there has been a demand for metal boxes that will defy the elements. It is to this demand that this concern is catering, and its 1909 models include such refinements as brass locks, brass catches, brass corners, aluminum mats, wood lining, partitions and trays. These boxes being made of pressed steel, are strong enough to be used as a step and are embellished by aluminum mats which are set in depressed panels in the cover. One of these models is 27 inches in length and contains three compartments. In one can be placed a 20-inch gas tank, air tank, tool roll, jack and pump; another holds a battery, while a third has a small tray for carrying tools, etc. The robe rails are made of brass tubing, reinforced by an inner tube of steel. Brass handles are used.

K-W Ignition Co.—The K-W magneto, which is of the inductor system, is intended to take the place of a storage battery, and is made in different types to be driven by belt, to be driven by friction from the flywheel, or to be gear-driven from the motor. These magnetos do not employ a separately wound armature, but the revolving shaft carries four wings, or inductor pieces regularly distributed at 90 degrees. Two are on one end of the revolving shaft and two on the other, and between them is a stationary copper ribbon winding. This magneto produces four sineways of alternating per revolution of the shaft. The shaft with its laminated iron wings are inductors and is the only moving part of the magneto, and the entire winding is limited to a copper ribbon, the ends of which connect directly with the binding posts on the magneto, thus eliminating

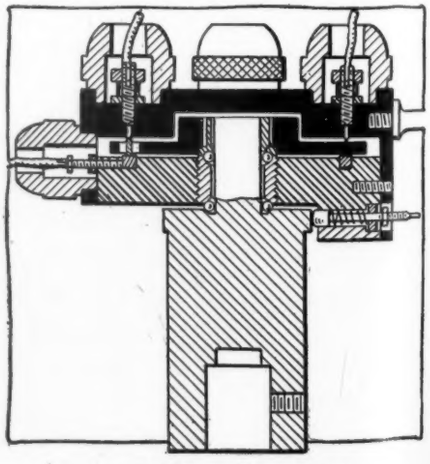


FIG. 2—MIDGET DISTRIBUTER

commutators and brushes. When friction or belt-driven the magneto runs at four times the crankshaft speed and generates a current of 7 volts and 9 amperes. When a magneto of this type is fitted, the wiring employed is identical with that used in the battery. The alternating current generated cannot be used, however, for charging storage batteries. A governor is not required on the magneto. Viewed constructively, the revolving shaft is carried on ball bearings, and horseshoe magnets are used, these being longer than ordinary.

McCanna Mfg. Co.—Four types of oilers are listed for this year by this concern, three of them intended for motor car use and one manufactured exclusively for motor cycles. The first of the motor car oilers is type A, designed for use on the dash of the car. It is a multi-feed mechanically-driven type and feeds by suction from an auxiliary oil tank carried anywhere on the car. The discharge capacity of the pump is double the suction capacity, which insures a clear sight feed at all times. This oiler is made with any number of feeds desired and owing to the auxiliary supply tank the mechanism on the dash is limited to the pumping parts. The type B, designed to be located on the motor, is operated by springs and cams, and has been on the market for several seasons. Type H is a regular double plunger pump with a reduction possible on the suction only, the discharge plunger always working to its full capacity.

London Auto Supply Co.—Three styles of tops and two styles of glass fronts will be exhibited by this concern. The styles of tops are as follows: Five-bow top for large touring cars, four-bow styles for medium touring cars, and the Handy style top for roadsters. In all of these cars the bows are 1½ by 1-inch second growth hickory inserted in steel sockets. Improvements made are along the line of better hardware fittings, such as bow separators, fasteners, etc. Of the two styles of glass fronts the London ventilator front is the leader. It is a folding type with wood framework with brass binding. For ventilating purposes the lower half can be swung either forward or backward, depending on the weather. The upper half is secured in an upright position by a thumb screw device. The other

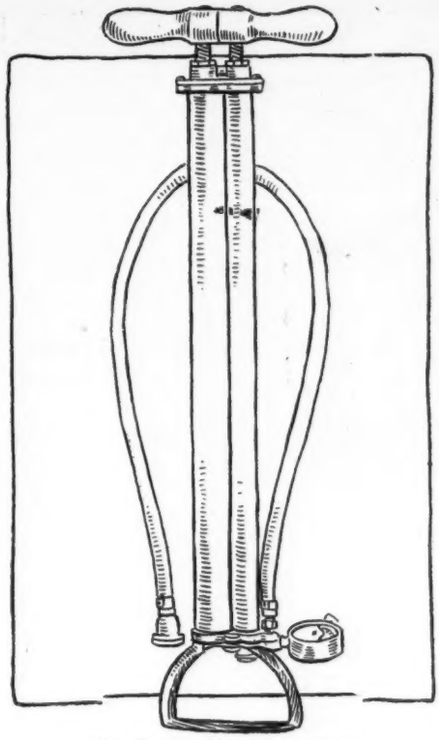


FIG. 3—HANCOCK TIRE PUMP

top is of the conventional folding type with wood framework with brass binding. Both of these styles of tops are supported through brace rods extending forward alongside the box.

Standard Ignition Co.—One of the novel features of the show will be the multiple-speed spark generator of this concern, in which the car on the coil or generator can have three working positions: First, when the car is run on speeds of more than 25 miles an hour; the second, speeds for from 25 to 45; and the third for speeds above 45. The reason of this threefold sparking tensity is due to the presence of three primary windings, around the power of the coil, outside of which is a regular secondary winding. The first primary consists of a two-current of wire; the second consists of twice as many turns of the same wire; and the third, four times as many turns on the primary wire. To get the first spark currents run through the first primary only; for the second spark it runs through the first two primary windings in series, and for the third spark through all three primaries and series. In conjunction with this will be shown the Midget combination distributer and timer, Fig. 2, a compact one but 2 inches in diameter and 3 inches long. It is made almost entirely of fiber except where metal parts are essential for the conduct of the current, and is carried on two races of ball bearings. The primary or commutator part is a four-point cam, the points of which contact with a single plunger on the primary of the battery, the cam being grounded. The distributer is a revolving disk with a metal pin in the periphery at one point. Beneath this disk and imbedded in fiber is a brass ring in the same plane as the pin in the distributer disk. In the cover are located the four vertical terminals connected with the plugs, and as the disk revolves the secondary circuit is completed each time the metal pin passes beneath a contact point.

Excelsior Supply Co.—The Zigzag tire chain, handled by this company, has a number of good features. This zigzag construction, in connection with the leverage of the fastener, tend to make the chain fit close to the tire. There is no vibration when chains are used with hard tires on hard roads, and there is less wear owing to the tight fit and the diagonal way of taking the strain.

Fulton & Zinke—The line handled by this supply house includes general car accessories, one of which is the Standard ignition cable, Fig. 5, which cable has six coverings, which in sequence from the cable outward are dark rubber, white rubber, dark rubber, varnished tape, waxed fabric, and an external coat of varnished fabric. The D-X commutator for two, four and six-cylinder motors is a conventional design with a revolving brush and radially-disposed plunger which bears upon the stationary segments. It is manufactured by the Duplex Coil Co., which concern manufactures Duplex coils, the characteristic feature of which is that there are two coils and primaries and two secondaries for each vibrator, which is illustrated in Fig. 1, and from which the name of the coil comes. This dual construction throughout the coil tends to give much higher vibration than with a single coil for each vibrator. The two coils for each vibrator are so wound that

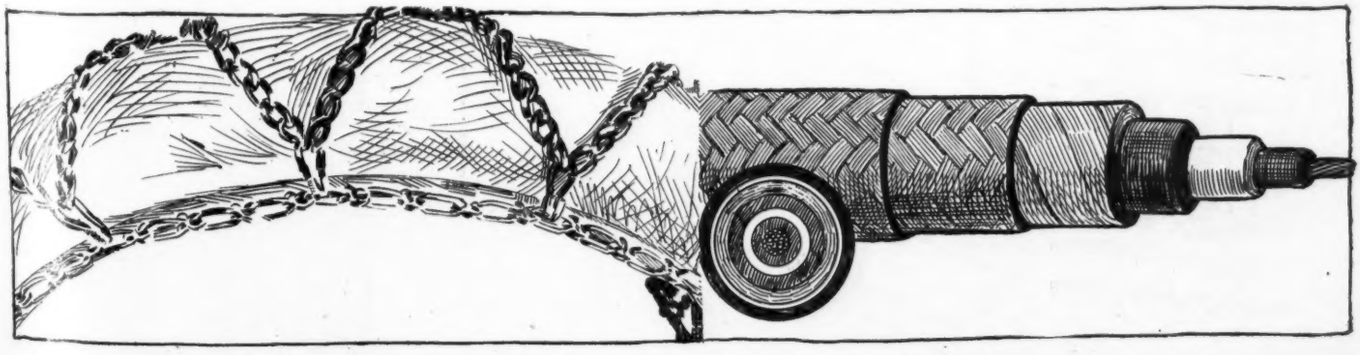


FIG. 4—EXCELSIOR STAGGERED TIRE CHAIN

FIG. 5—SIX-COVERED STANDARD IGNITION CABLE

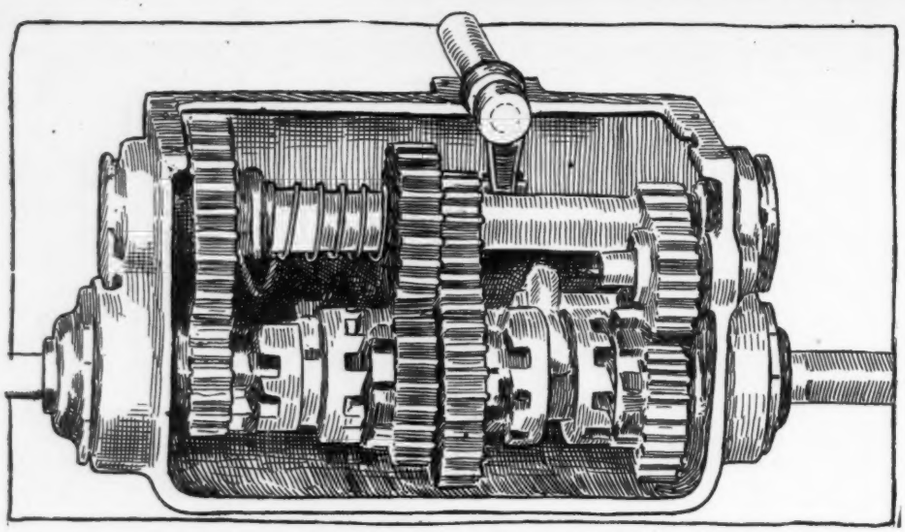


FIG. 6—THE COTTA SLIDING CLUTCH TRANSMISSION

a south pole and north pole operate upon the vibrator. The coil has been improved by the use of platinum iridium points, adopted because of the little wear in conjunction with them. A particular novelty is the multi-unit gas engine of the four-cylinder opposed type with the cylinders cast in pairs and one-half of the crankcase formed integrally with each twin casting, so that the motor in reality consists of but two castings. Each casting carries an integral waterjacket, as illustrated in Fig 13, with valve chambers on the cylinder heads containing mechanical intake and exhaust valves, the motor operating on four-cycle lines. The surprise of the spectator when beholding the outside is increased when with the crankcase cover removed the use of a two-throw crankshaft is revealed as well as the employment of but one piston for two cylinders. The piston, as illustrated, is long, with one head in one cylinder, and the other head in the opposite, so that as it works on the compression stroke one end will be on the explosion or suction in the other. One connecting rod is used for this piston, and fastens to one end of it in the usual manner. The center of the piston is entirely cut away except for connecting parts which are spread sufficiently to permit of the free movement of the crankshaft in the lower end of the connecting rod. The peculiar construction used makes it possible to have a 4 by 4-inch four-cylinder motor weighing 250 pounds, and rated at 25.3 horsepower. Its length over all is 27 inches, it is 18 inches wide and 4 inches high. Particularly great accessibility is furnished by designing it so that after the cover of the crankcase is removed a rectangular casting carrying the camshaft with all the lifter-rods can be lifted out of place, leaving the motor exposed. The Churchill mechanical lubricator, handled by this concern and shown for the first time this year, has not been changed during the past season. This lubricator is of particularly neat construction and consists of a series of right-angled rods of small diameter, and a set of six, eight or ten according to the number of feeds in the pump. At one end these rods enter a cylindrical cylinder containing a chamber for each pump, and at the opposite end they enter a similar chamber which is at right angle with the previously mentioned one. The rotation of one cylinder results in the rotation of the other through the medium of the right angle plunger rod, and during each rotation the plungers work in and out in their chambers in the respective cylinders. The design is such that one of the plungers elevates oil to the sight feeds and the other end to the bearings. All of the machinery on the oiler is carried on the cover and may be removed with it.

Long Mfg. Co.—For the season of 1909 this company has three types of radiators—the spiral tube, Fig. 7, flat tube, honeycomb, Fig 8, and the square tube cellular, Fig. 9. The spiral tube has been manufactured by this concern for years and consists in securing corrugated fins wound spirally around the tube. The flat tube honeycomb type consists of vertical water channels from the base of the radiator to the water tank on top and between these tubes are inserted radiating strips giving a diamond as seen from the front. In this radiator the water tubes are large and the direct water course from top to bottom is looked upon to eliminate clogging. Should a leak occur the fins between the water tubes can be removed, permitting of repairing the tube. The latest Long radiator is the square tube cellular type, Fig. 9, in which the water is conveyed through vertical tubes extending direct from top to the bottom with the additional facility of transverse currents at three points in the radiator jacket. This radiator is of special construction on which patents are pending, and is very light. It might be described as a fourfold type, the three heavy horizontal lines in the illustration marking the division in the parts and indicating the transverse water channel. Should the top section become injured it can be removed by simply mounting the solder along the top heavy line. In similar manner any of the other sections may be removed, leaving the others intact.

Legnard Brothers—In connection with their exhibit of Permanit, powder to be inserted into a tire and hold same in case of puncture, Legnard Brothers, Waukegan, Ill., manufacturers of motor car and marine accessories, will show the

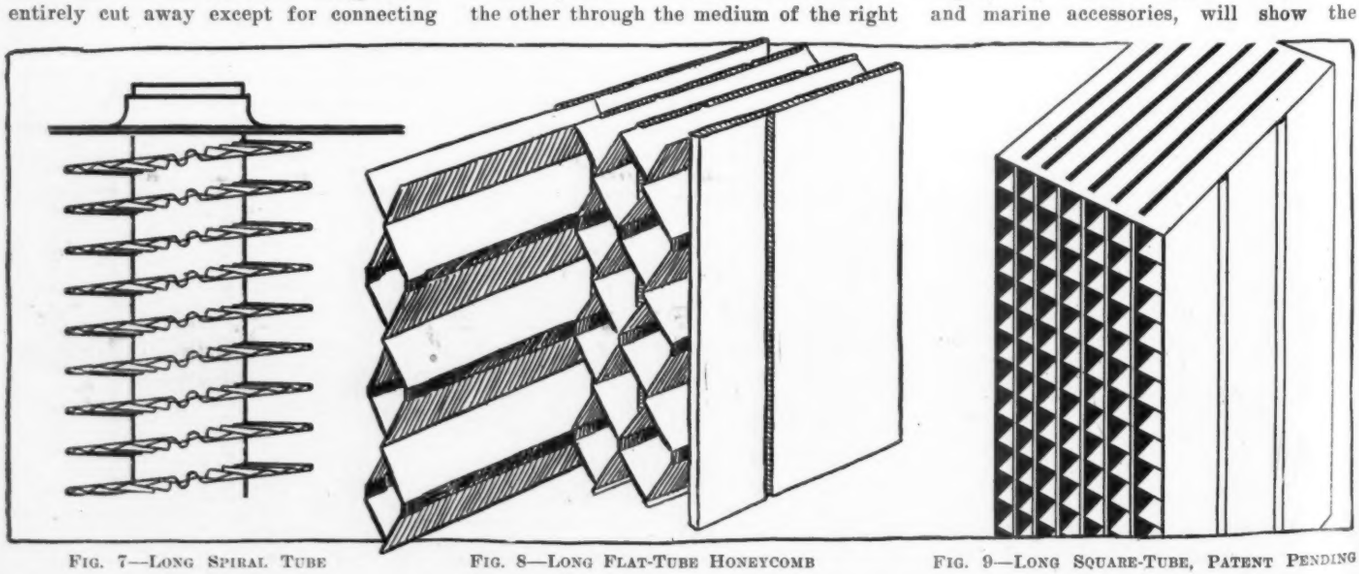


FIG. 7—LONG SPIRAL TUBE

FIG. 8—LONG FLAT-TUBE HONEYCOMB

FIG. 9—LONG SQUARE-TUBE, PATENT PENDING

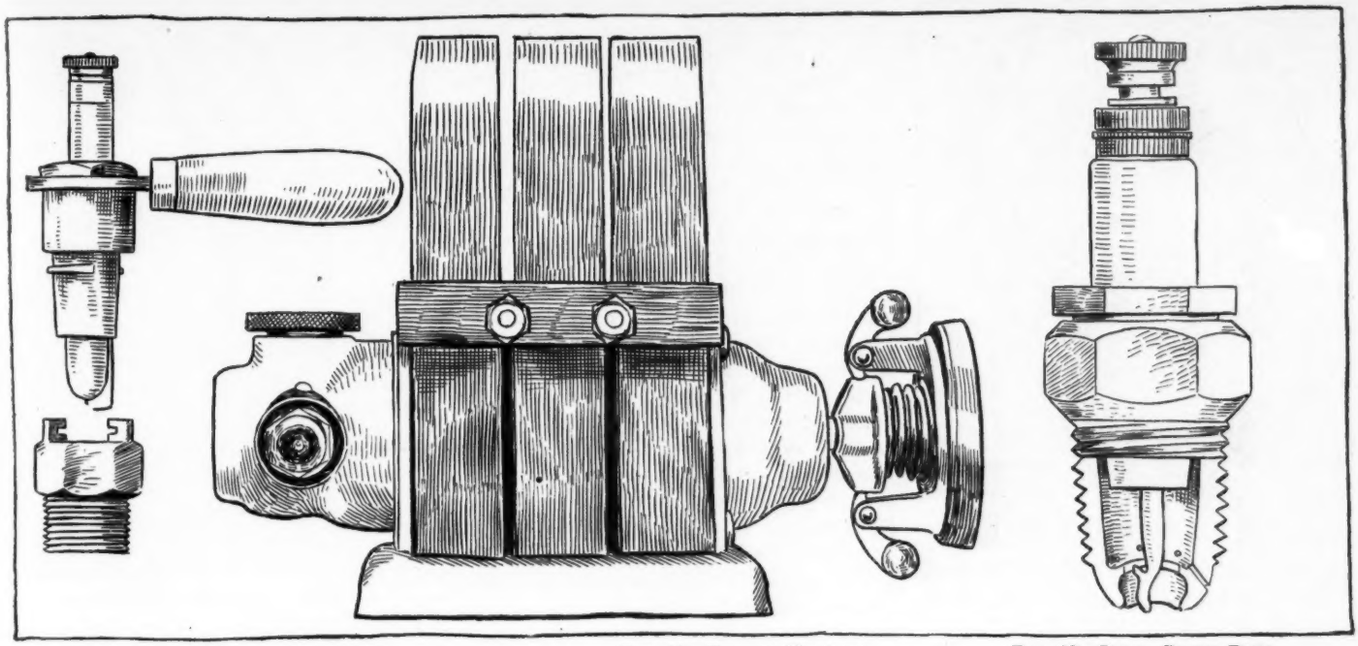


FIG. 10—AUTO-MARINE SPARK PLUG

FIG. 11—EUREKA MAGNETO

FIG. 12—POINT SPARK PLUG

Auto-marine spark plug Fig. 10. This plug is of the breach-block type with the electrodes, which are made to withstand a high temperature of heat and insulated with porcelain, both attached to the removable upper section. By giving the insulated handle less than one-quarter turn, it is possible to remove the upper portion for testing or cleaning without danger of a shock, or detaching the wire. The locking device consists of a ground tapered cone fitting, which is held secured in the conical recess by two heavy tapered cam shoulders.

Fred W. Smith—The Point spark plugs, manufactured by Fred W. Smith, Aberdeen, S. D., will be on exhibition with a large working model to illustrate its good features. The plug Fig. 10 has a large base and a large central electrode; and the spark instead of jumping across at the bottom, as in most plugs, jumps from a nipple on the electrode to a ridge formed by a constriction of the internal chamber, the walls of which are threaded on the outside with the standard thread and perforated just above the construction to allow the gas to be ignited to fill the spark chamber. Mr. Smith also manufactures an anti-skid device in the form of a tire chain, Fig. 14.

Eureka Magneto—The Henrick's Eureka jump spark magneto will be exhibited by Eugene Arnstein. This magneto is a current generator designed to take the place of the storage battery, and to be used in connection with the ordinary coil. It has a ball-bearing armature shaft, with an automatic governor, and may be friction-driven from the flywheel or driven by belt or chain from any desirable part of the motor.

S. Freakstone—The Cotta sliding clutch transmission will be exhibited at the show by this manufacturers' agent for motor car parts, accessories and specialties. This transmission is of the selective sliding clutch type, giving three speeds forward and reverse. Both shafts are in the same vertical plane; gears are always in mesh; and all gears and countershafts remain idle on high speed. The case is of one-piece construction but may be made in two sections if desired. Timken roller bearings are used throughout.

Whiteley Steel Co.—Manufacturers of motor cars, gas engines, pneumatic tools, etc., may be interested in the exhibit of the Crown steel castings, manufactured by this concern. There will be nothing sensational about this display and to a casual observer it will simply be a display of castings, but interesting just the same.

Firestone Tire and Rubber Co.—This concern will exhibit for the first time its new side tire demountable rim for use upon commercial motor vehicles fitted with side wire tires. It consists of four parts: First the removable rim on which the tire is carried; second, the locking ring having a triangular cross section and resting between the beveled outer edges of the outer removable rim and the fixed base on the wood felloe which is the third part. And fourth, a removable side flange bolted to the felloe and holding the other parts rigidly in place. In general design it is much similar to the Firestone demountable rim for pneumatic tires. The particular value of a demountable rim of this type for commercial vehicles is the reduction to a minimum of the time and effort required in changing tires. In fact, a new tire can be substituted anywhere on the road. In removing the tire the flange is removed, the locking ring then comes off, and the removable part of the rim is then ready to be taken off.

Hancock Mfg. Co.—In addition to its regular well-known line of Hancock valveless force-feed oilers, the Hancock com-

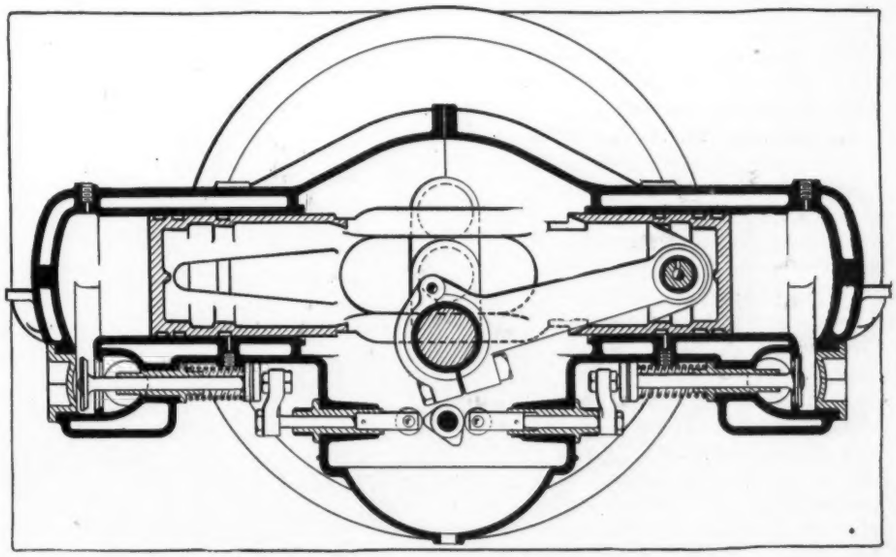


FIG. 13—MULTI-UNIT FOUR-CYLINDER GASOLINE ENGINE

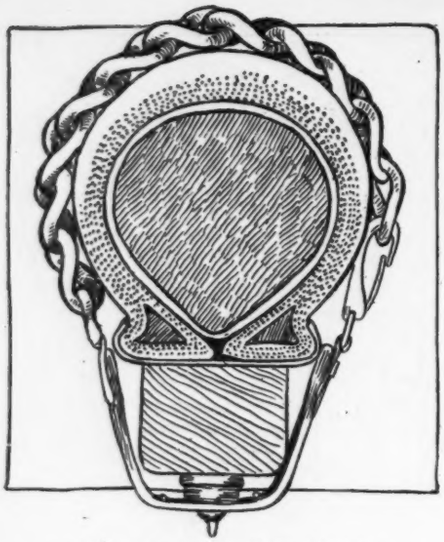


FIG. 14—SMITH TIRE CHAIN

pany has a line of grease and oil guns and a new tire pump, which is illustrated on page 63, Fig. 3, this issue. The construction is such that the pump works easily at high pressure, being sold under a guarantee to do so, and has a foot valve in the bottom that will hold air. Special care has been given to the detail of the packing of the top and to the leather of the plungers to make the pump efficient. The relatively small diameters of the barrels makes pumping easy and the jump is light in weight and has good wearing qualities.

Imperial Brass Mfg. Co.—A line of articles in drawn, pressed and cast brass, bronze, copper and alloys of these metals quite too long to fully enumerate is made by this Chicago concern. The line is essentially the same as last year, the principal articles being compound foot and lever pumps, dash hand pressure and oil pumps, centrifugal circulating pumps, centrifugal gasoline strainers, pressure regulators, auxiliary gasoline tanks, combined priming cups and relief cocks, pipe unions and connections, lamp brackets, robe and foot rails, windshield fittings, name plates, electric lamps, hood fasteners, grease cups, and so on.

Ross Gear and Tool Co.—Some important improvements in the design of the Ross steering gears have been made for the coming year. These gears are made in three types and sizes, for use on trucks of 5 tons' capacity, on touring cars and runabouts and on motor buggies. They are oil-tight and dust-proof and are designed and made so that there are no points or lines of contact, the bearing surfaces being of such large proportions as practically to eliminate wear and prevent lost motion. These steering gears are neither of the worm and nut nor screw and segment type, but are in a special class. Briefly, the worm screw is attached to the tube and turns with the steering wheel. The screw works in a phosphor bronze sleeve that is forced up or down as the screw is turned one way or the other. The sleeve has several quick pitch spirals on its outer surface that engage in spiral grooves in the housing by which the gear is attached to the car. These spirals force the sleeve to rotate as it is moved upward or downward by the internal screw, and as the sleeve rotates it turns the lower post, which has eight straight keyways milled in it. The lower post is brazed to the steering arm and therefore rotates it. The great difference in the pitch of the screw and the spirals on the outside of the sleeve makes the gear irreversible, which is most important in steering gear construction.

Universal Tire Protector Co.—The improved Universal tread Fig. 15 has a full width main body of extra heavy chrome leather reinforced and armored all the way over, as shown in the drawing. The non-skid traction armor, which is a distinctive feature, is made of single and double steel burrs, each having a swaged taper hole and held in place by heavy countersunk steel rivets which, when set, completely fill the holes and leave a smooth surface inside the tread and produce a non-skid puncture-proof protector. A special ratchet tension anchorage is used, which consists of a pair of flat annular steel bands having a channel ratchet connection. These bands engage all the non-detachable hooks along the edges of the tread and a tool is employed to draw the ends of the bands together, reducing the circumference and drawing the tread down over the tire independently of the felloe or rim to the degree of extreme tension that is necessary to prevent slippage and creeping. This means of anchorage permits of subsequent adjustment to take up any stretch or slack in the tread. The Universal tire sleeve—Fig. 16—has a double means of attachment, consisting of a strap to be passed around one of the spokes and two special ratchet tension anchorages. These devices have metal seats to fit the felloe and draw up and hold the straps by means of small drums that are turned by a wrench. Marginal hooks are eliminated, hooks on the strap ends engaging curved side plates riveted directly to the sleeve margins.

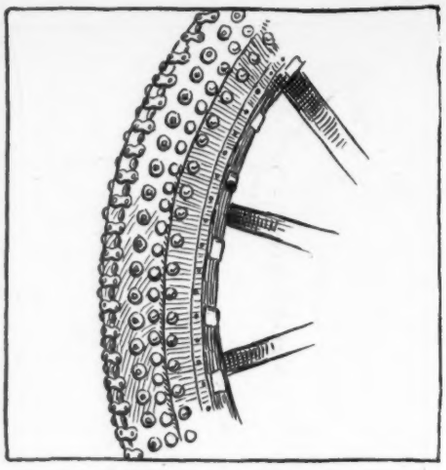


FIG. 15—UNIVERSAL TIRE TREAD

Rochester Safety Lock Co.—This concern manufactures a combination motor lock which is intended to prevent the steering gear from turning and thereby make the theft of the car impossible. It is a combination padlock, no key being used. The lock is made in three sizes, and when not in use for anchoring the car, it can be used as a padlock on a tool box or other parts of the machine.

Chicago Recometre Co.—The Recometre, which will be exhibited by this concern, is a combination device consisting of a complete clock and calendar showing at a glance the time of the day, the day of the month, the month of the year, the year of our Lord—and then some. It records in ink on a ribbon the number of miles traveled per day, the time for each ½ mile and mile, the number of stops made, the time at which each stop was made, the lapse of time during each stop, and the time of each start.

Pfanstiehl Electrical Laboratory—The 1909 Pfanstiehl coil embodies a number of improvements over the 1908 type, chief of which is a change in the vibrator construction. The company continues, however, its patented system of winding and insulating its coils in order to prevent and guard against breakdowns, and this part of the coil is sold under a 5-year guarantee. The new vibrator is claimed to be foolproof, and the claim is further advanced that it may be tampered without resulting in harm. It is designed to allow for a minimum current draw on a short circuit of ¼-ampere, and a maximum of 1 ampere, without the possibility of freeing or being thrown out of adjustment. The contact points are placed permanently and are not moved in making adjust-

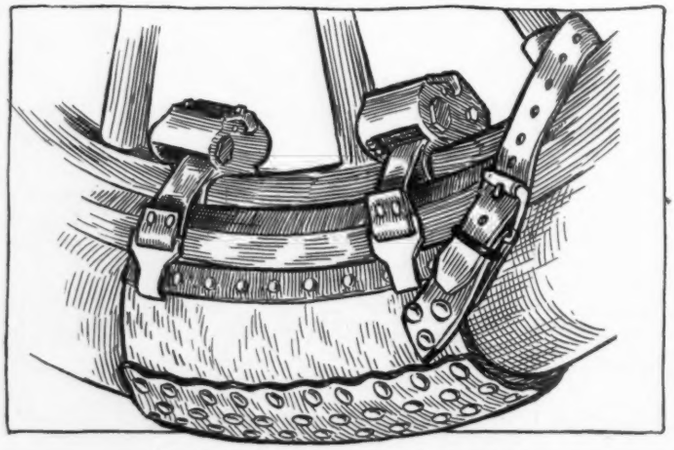


FIG. 16—THE 1909 UNIVERSAL TIRE SLEEVE

ments. The vibrator tension is secured by means of a spiral spring acted upon directly by the adjusting screw. A slight change in the switch is in that the key action is similar to that of an ordinary door key and is intended to serve as a secure lock for the machine. The complete 1909 coil is considerably smaller and neater in appearance than former models and the connections are more accessible.

Chicago Battery Co.—To be exhibited for the first time by this concern is its Dixie storage battery, the Duro coils, and lighting batteries suitable for motor cars and motor boats. This is a trio which will attract attention in addition to the general line of the company. The company's lines of coils include every type and size of the regular vibrator and spark type.

Commercial Battery Electric Co.—This concern's Combat ignition storage battery for ignition purposes is a 6-60 battery, in which the goods and plates are claimed to be made by an exclusive metal which gives increased power and durability. The battery is carried in a case with a one-piece hard rubber cover sealed without any metal fastenings whatever. This is done to prevent corrosion. A feature of the battery is a patented grease cup attachment which prevents corrosion. The company holds patents on this in addition to the battery.

Reflex Ignition Co.—This company is putting out a new spark plug which may be insulated with mica or porcelain at the option of the purchaser; and with ½-inch standard metric or A. L. A. M. threads. A feature of the mica plugs is that the insulation is double, the inner section being rolled lengthwise on the car from a thin strip of mica while the outer sections are simply mica washers which act merely as a protection to the inner insulation. The core is held in place by bronze seats and requires no packing.

Vivax Storage Battery Co.—This concern's batteries have been improved and the terminals changed from a wing nut to a nickel-plated thumb nut. For the convenience of the motor car trade, the company has added a 6-volt special and a Junior. A storm cover is now added to all of the battery types, permitting of batteries to be carried inside or outside of the car body. In the base of the battery a ½-inch space is allowed for the collection of particles of matter from the grids so that danger of short-circuiting is avoided. Hard rubber separators are used.

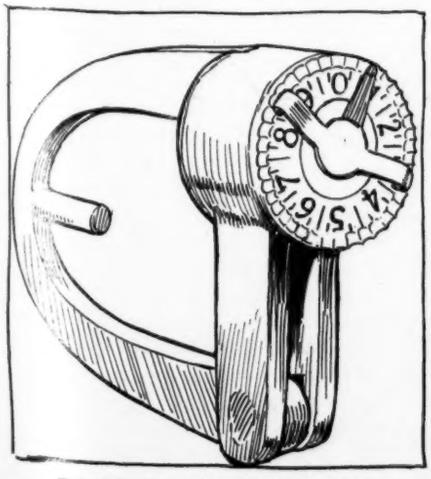


FIG. 18—ROCHESTER SAFETY LOCK

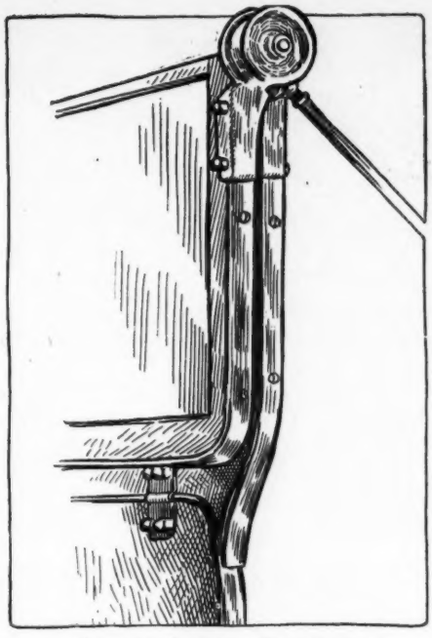


FIG. 17—RAMBLER WINDSHIELD

Valentine & Co.—Prepared varnishes in various grades and a larger line of colors for finishing bodies and chassis than ever before will comprise the display of this house, established in 1832. The colors will be shown in an attractive manner upon glass. About 85 per cent of the motor car makers of the country are now being supplied with Valentine varnishes, it is claimed by the company.

Fellwock Automobile & Mfg. Co.—The new line of this company for 1909 consists of baby tonneaus, rumble seats and folding seats for Maxwell cars and the Perfect windshields. The baby tonneau is an extra rear surrey seat for two passengers, designed to be attached to the rear deck of Maxwell runabouts. It can be set on and attached securely in half a minute without any alteration of the car. It is made with floor board covered with a rubber mat to prevent scratching of the finish on the regular deck of the car. It is furnished with steps and a trap door in the back affording access to the interior of the deck. The rumble seat is for one person only, and the Little Dandy folding seat is for one or two children. Both fold down into the rear deck. The ony change required in the car is the removal of the deck lid. The Perfect windshield is adapted for Maxwell, Mitchell, Buick, Ford and Reo runabouts and touring cars, and other machines with metal or wood dashes, either curved or straight. It is divided across the center and provided with hinges and patented catches so that the upper half can be raised or lowered while running. There are no nuts or thumb-screws to turn. It is made in solid mahogany, with brass bound edges and French plate glass windows.

Central Rubber Co.—As manufacturers and selling agents for other makers of rubber goods, this Chicago company will have an extensive display, embracing a complete line of G & J and Morgan & Wright motor car tires, a line of motor cycle and bicycle tires, many of them of its own manufacture; mackintosh coats for motoring, and various rubber sundries. Its tire repair department will be fully represented, sections of tires in course of repair being shown in the booth.

Standard Varnish Works—A display of fine panels finished in modern, up-to-date colors and Standard motor car varnishes will be made, supplemented by an interesting collection of gums of various kinds from which different grades of varnishes are made and which have been collected from all parts of the tropical world.

F. E. Sparks—As factory representative in Chicago, Mr. Sparks will have a representative exhibit of Nonpareil horns, Gilbert tire covers and sundries, Bowers carbureters, Thermoid brake lining, inner tubes and casings; Weed chain tire grips, American coils and spark plugs, Bowen oil and grease cups and Acme universal joints.

Rambler Windshield—The Rambler windshields, used on the company's cars, have a mahogany frame of the same color as the dash. It is supported by brace rods extending forward at either side of the bonnet. A commendable feature in conjunction with this shield is the ability to lock the upper, or movable section, of the glass at any desired angle, at which it is rigidly held by the clamps operated by finger wheels adjacent to the hinges. With the upper half of the shield down, as illustrated, Fig. 17, the view of the driver is not interfered by heavy cross strips between the halves of the shields.

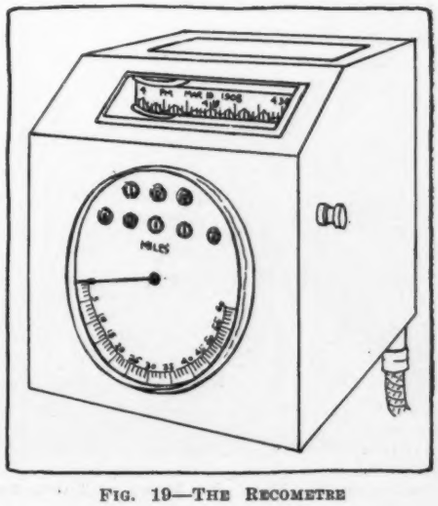


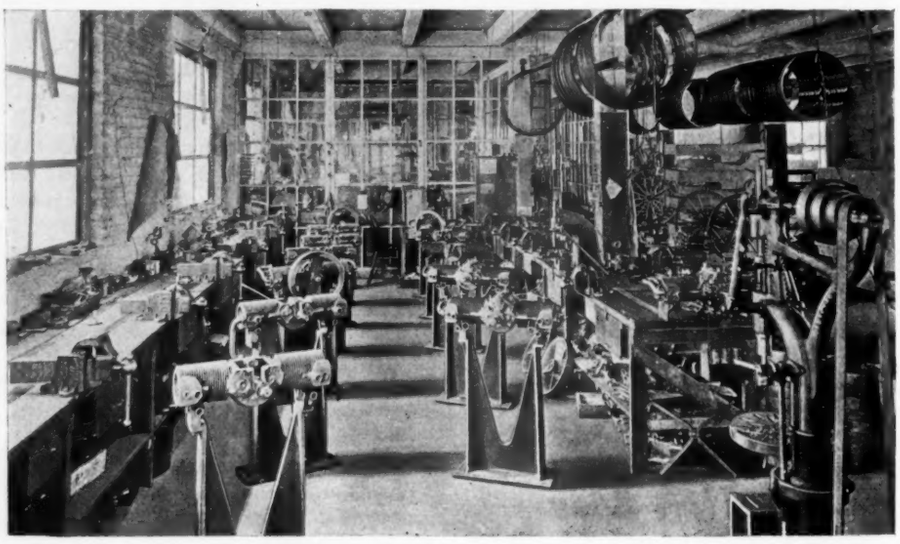
FIG. 19—THE RECOMETRE

Progress of the Motor Buggy

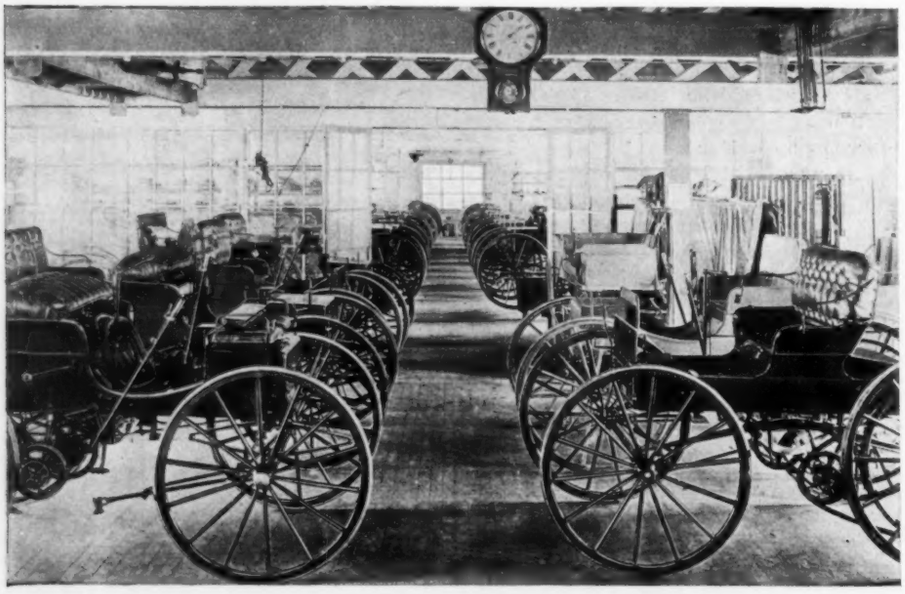
THOSE who visit the Chicago show with the idea of making a critical study of the various types of cars should not fail to visit the basement of the Coliseum, for there is grouped a brave little band of pioneers, who already have made noticeable advances in the manufacture of the high-wheeled type which generally is known as the motor buggy. Not all of the dozen who will exhibit the high-wheeler will be found in this subterranean section, for a few have been fortunate enough to get upstairs.

The motor buggy has met with wonderful success in the short time it has been before the public. It has demonstrated its utility in more ways than one and has won for itself many friends. As far back as 1903—February, to be exact—Henry K. Holsman, of Chicago, an architect by profession, put on the market his idea on which he had been working for a couple of years. Mr. Holsman owned a low-wheel motor car of the conventional type in 1901 and in operating it saw where, in his estimation, it could be improved. So he set his brains to working and the motor buggy was the result. His aim was to produce a mechanically-propelled rig that would be "high enough to travel the country roads like a carriage without breaking or dragging its under parts on the ground when a ridge in the middle of the road was encountered or when one or both wheels dropped into a rut," as he expressed it. He wanted it to ride clear of rocks and stumps and to climb hills that a horse and buggy could. He favored a solid axle and desired to side-step the differential or equalizing gear, to avoid friction clutches and to be able to get along without using a differential gear or driving chain for a brake. Also he wanted to have a motor which could laugh at Jack Frost and he aimed to dodge the puncture demon by fitting solid tires.

For 2 years he worked along these lines and among the ideas he conceived was the swinging countershaft which he patented and which was on his first motor buggy which he put on the market in February, 1903. His first rig was sold in South Dakota. This marked the debut of the motor buggy and the formation of the Holsman Automobile Co., which now claims to be the pioneer in this industry.



ASSEMBLING MOTORS IN HOLSMAN PLANT



AN AISLE IN PAINT SHOP IN HOLSMAN FACTORY

In Reliability in 1903

It was 3 years later before Mr. Holsman had any serious opposition in his line. In the meantime he has been spreading the doctrine of high wheels and solid tires until he had made quite an impression upon the motoring public. He had put his car to the test of the roads by driving it in that historic reliability run of the Chicago Automobile Club in 1903 in which he made a perfect score over the 100-mile route that was used. He had placed it on public exhibition in the Chicago show of 1905 and had started people talking about the possibilities of the rig. Farmers had seen in it a machine fashioned along the lines they had regarded as most practical for the country roads, while doctors had recognized that it was peculiarly adapted to their work because of the air-cooled engine and the solid tires. Therefore, the

motor buggy made an instantaneous hit in these two professions and this popularity is constantly growing.

As a Commercial Proposition

As a commercial proposition the motor buggy is just beginning to find its own. In the earlier days the designers worked along the lines of improving it for the carrying of passengers just as did the engineers in the motor car branch. Now, however, the buggy has reached what might be called such a stage of perfection that the designers can look around and cater to the business men who wish light delivery rigs that are adapted to their work. The Holsman, Duer, Kiblinger and several others already have produced something along this line and others are following their example.

But harkening back to the pioneer days, it is recalled that Holsman was followed by others. In 1906 the Staver, Duer, Schacht and Reliable Dayton came into the fold and the year following the Bendix and the International Harvester were produced. At the present time there probably are a dozen concerns which have a stable footing in the manufacturing game, while fifty or sixty others are trying to break in. Indiana is a hotbed in the motor buggy manufacturing line. Carriage makers in the Hoosier state have read the handwriting on the wall and nearly every concern in the state either is producing a high-wheel mechanically-propelled rig or is working out plans to cut into the game at the earliest possible moment.

Problems of the Designers

Designers of motor buggies faced a great problem when they set out to produce a machine that would suit the masses. They had absolutely no precedent to follow. Of course, it was no trick at all, comparatively speaking, to install an engine in a buggy and make it run, but that did not make such a combination a success. What was desired was a rig that would not shake to pieces after a few hundred miles of going on rough roads and a machine that would be comparatively quiet. They had to start an anti-rattle crusade and to solve problems arising from the different actions of solid and pneumatic tires. Time and thought brought about a victory in the anti-rattle campaign, it being discovered that a step forward had been taken when the ball and socket joint with a spring adjustment for keeping the tension tight was adopted. They realized that the fundamental principles of their industry were high wheels, air-cooling and solid tires, and how well they have worked along these lines may be judged by an inspection of the machines on view in the Chicago show.

WHERE MOTOR BUGGIES ARE ASSEMBLED

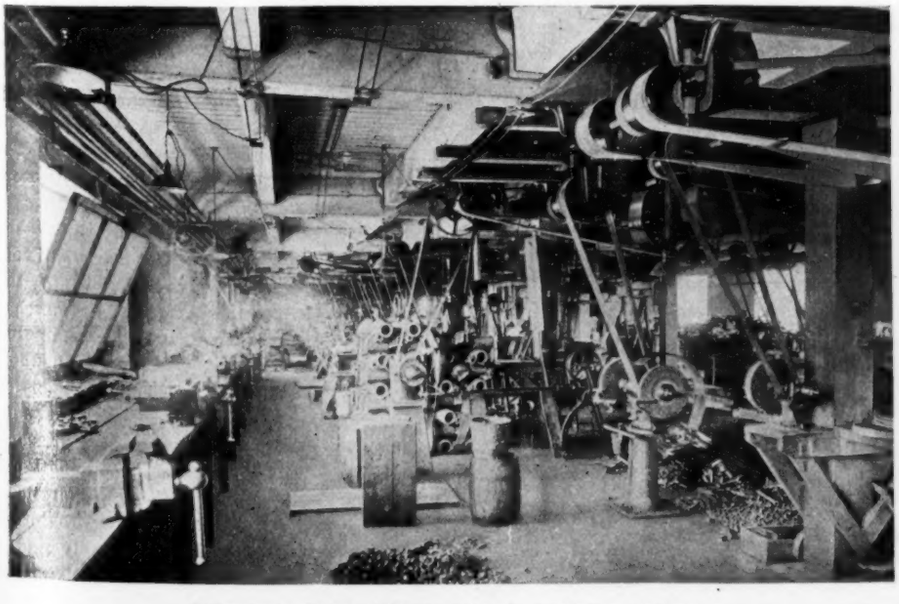
The transmission was another puzzler, it being clearly apparent that this was an important part of the motor buggy and one which had to be carefully devised. Holsman started with the cable, and so well did it suit him that he has retained it and now it is found on his present models. This transmission consists of a movable powershaft suspended on hangers by roller bearings and revolved in a forward direction. There are two deep-grooved pulleys at each end of the shaft, the larger one engaging by means of a flexible chain cable, a corresponding pulley attached to the spokes of both rear wheels to turn them forward. To reverse a friction pulley is utilized. All the motor buggy makers, however, do not follow Holsman in this transmission idea. Many of them favor the chain and on the Bendix is found a twin friction disk.

The lever is the popular method of steering adopted by most of the buggy men. They claim it is sufficient so far as control is concerned, being quicker and more positive than the wheel and not developing lost motion on account of the wearing of gears. Still, they encounter the same prejudice on the part of the public as do the motor car designers. The people like the wheel because of its looks, but in most cases the motor buggy people stick to the lever as being far more suited to the high-wheelers.

Popular East and West

The motor buggy generally is spoken of as a western product. So it is, but this does not necessarily mean that it is popular only in the west. Far from it, say the makers of this type, who assert their product is used as generally in the east and far west as it is in the home belt.

Some pretentious plants are being utilized for the manufacture of motor buggies and in Chicago the factory of the Holsman company is held up as a model of its kind. It is located at Morgan and Thirty-sixth streets and is on the Chicago Junction switch which affords shipping facilities on every railroad running out of Chicago. The building is three stories high and is 220 feet long by 50 feet high. At the present time there are 200 workmen employed.



MACHINERY USED IN MANUFACTURE OF MOTOR BUGGIES

AS USUAL PHILADELPHIA HOLDS BIG SHOW

PHILADELPHIA, PA., Feb. 2—Made up of forty-six separate exhibits—of which forty-two are of motor cars, four of motor cycles and twenty of accessories—this show is really the most comprehensive ever held in Philadelphia. From the complete car standpoint the New York shows had little or nothing on this, for no fewer than fifty-two of the better-known American and foreign cars have been crowded under the armory roof, the actual number on exhibition being 154.

It is only from the viewpoint of the accessories enthusiast that this show is lacking. But even here about every device of practical use is either exhibited or represented, for the majority of the accessories exhibits are those of supply dealers who are showing the best of everything their various lines include—a trifle cramped, it is true, but they are there. But it must be admitted that when eight or nine thousand visitors crowd the narrow aisles there is little room left for the buyers. The latter have become wise to this condition of affairs, and have taken to early-afternoon visits in order to get the time and the opportunity to make the careful preliminary examination without which the prudent Quaker motorist would not think of investing his money.

Color Scheme Daring One

The color scheme here is a daring departure from the tenets of the "quiet and dignified"—nothing less than Nile green and pink, if you please. But perhaps that combination isn't a winner! It lends itself especially to the manner of hanging the decorations, which gives the big armory the effect of the interior of a huge square tent, the central roof feature being a huge staff device dotted with myriads of electric globes, with long strings of lamps caried therefrom to every side and corner of the armory, while immediately above are looped alternate strips of Nile green and cerise material so closely draped as to entirely hide from view the unsightly girders of the roof. These strips are carried from above the huge central electric device to the far sides and ends of the building, giving the tent effect spoken of above. Opposite the main entrance debouches into the main aisle, which is lined on each side, placed at booth intersections, with staff columns in Byzantine period effect, each opposite pair connected by a graceful lattice-work arch, entwined with beautiful artificial flowers. This lattice-work effect is repeated around the sides of the entire armory, giving a general effect which, while decidedly effective, is not garish. At the corner intersections of the booths are placed columns similar to those which border the main aisle, and, like them, studded with numerous electric lights. From these columns, on golden poles, are hung dark blue silk gonfalons on which the names of the various cars are shown in golden lettering. Similar banners over all the exhibits along the walls carry out the decorative scheme, and put the visitor wise as to the name of the car or the accessories display he is inspecting. Kendle's string band, perched on a hanging balcony at the far end of the armory, opposite the main entrance, can be heard, but not seen, being ensconced in a veritable floral-electric bower.

ONE OF THE AISLES

Motor Cycles Admitted

While it has been the original intention, owing to the lack of space, to limit the exhibits to cars and accessories, the pleas of the motor cycle makers became so insistent that at the eleventh hour Manager Beck decided to secure one of the large main-floor company rooms to accommodate them. Here, to the right of the main entrance, is the motor cycle annex, and four deadly rivals for the two-wheeler business held forth here with fifteen machines of various power and price. They are the Reading-Standard, Thor, Marsh-Metz and N. S. U. They are doing business, too, despite the fact that the motor cycle side-show is removed from the madding crowd that throngs the main tent.

The lack of exhibition room is impressed upon the visitor from the moment he enters by the crowding into the corridor at the left of the entrance of a single specimen—but a most beautiful one—of the handiwork of the Woods Motor Vehicle Co., of Chicago. It is a coupe fitted up with every luxury and convenience, and on McKinley's birthday it was fairly smothered in pink carnations.

Big Attendance Reported

Despite the uptown location of the armory and the distance from the hotel, wholesale and motor districts in the center of the city, this show will exceed by 50 per cent all previous attendance records for similar exhibits held in this city. Manager Beck figured out on Saturday night, the fourth of the show, average daily admissions of nearly 8,500, which, in view of the narrow aisles—necessitated by the clamorous demands for space and more space—made uncomfortable crowding a nightly occurrence. Indeed, even the afternoon crowds were so comparatively dense as to push the overflow into the various stands and interfere somewhat with the conversation artists connected with the various displays getting in their best licks. However, the real business of the mornings and early afternoons more than compensated for the evening discomforts, and there are few dissatisfied exhibitors. All hands know the handicap under which Philadelphia show promoters have long labored, and "if we only had a Madison Square garden here" was often heard, from visitor and exhibitor alike.

ENTRANCE TO THE PHILADELPHIA SHOW

Like all modern motor shows, real novelties are conspicuous by their absence. But there is "something new" at the Philadelphia show which, whether it is practical or not, is yet a sort of eighth wonder. It is the Carroll carbonic acid gas car. Mounted on a runabout frame of about the 1905 vintage, the little engine, for which the inventor claims 31 horsepower, looks insignificant indeed. The utter simplicity of the engine is accentuated by the absence of radiator, carbureter, sparking devices and all the other necessities which go to make up a complete gasoline car chassis. And yet Mr. Carroll claims he has harnessed CO_2 until it will do his will. A peculiar feature of the Carroll exhibit is that there is no conversation corps to dilate on the merits of the invention. Instead a neat little booklet is handed out at the stand which answers possibly a third of the questions which have been asked concerning it. No attempt is made to secure purchasers or subscribers to stock. The exhibit stands there for the crowds to look at, feel of—smell, if they care to—and that is all there is to it. That it goes hundreds of Philadelphians are willing to swear. What makes it go they are not so sure of. Perhaps this show has launched a revolutionizer. *Quien Sabe?*

Racing Trophies Displayed

Every exhibitor whose product has captured trophies on track or road has his plunder displayed prominently. The Fiat has its Savannah grand prix cup. At the Matheson stand proudly reposes, among other trophies, the $600 MacDonald & Campbell cup, captured on the heartbreaking Wilkes-Barre run of the Quaker City Motor Club. The Acme exhibit's main feature in the prize line is its second-place cup in the Fairmount park Founders' Week race, the Locomobile crowd going them several better with the cups symbolical of first place in the same contest and its still greater win in the Vanderbilt race. A veritable forest of small cups crowns the Pullman exhibit, a similar display being a marked feature also of the Stanley exhibit—and so on. The little Lampo is the star card at the Lancia booth, the triumph of Hilliard at Savannah having been supplemented only recently by Mrs. Cuneo's win in the same little car on the run of the Women's Motor Club of New York from the metropolis to this city and return. The dust-and-mud-begrimed transcontinental Brush is also in evidence, the car being carefully watched in order that none of the apparently precious grime of travel shall be accidentally removed.

The show promises to be as successful as a business proposition as it is pleasing to the eye. Not in the sense that it will prove a money-maker for the promoters—for that was a foregone conclusion before the doors were opened last Wednesday night—but that exhibitors as a rule will find their expenditures for space and the extras well worth while. Already there are records of numerous sales. The biggest bit of business done up to date was the closing of a deal between the Autocar Co. and the Pennsylvania Taxicab Co., whereby the former will furnish twenty-five vehicles for the latter, for use in this city. Wayne Davis, 15 minutes after 8 o'clock on Wednesday night, recorded the first actual sale of the show—a replica of the Matheson which won the Philadelphia-Wilkes-Barre endurance run of the Quaker City Motor Club. Since then sales have been numerously reported, scarcely a single exhibitor being overlooked in the selling line.

INTERIOR VIEW OF THE SHOW

Local enthusiasts were much interested in E. Rand Hollander's announcement that the Fiat Co. of America is planning to erect a huge plant at Detroit for the manufacture of these cars in this country. Mr. Hollander intimated that his company is about to go out for American trade in earnest if a suitable factory location can be found. The raw material and castings would be imported from abroad, and machined here. If the present discussion of the tariff should result in a marked lowering of the duties on finished cars, it is hardly likely that the immense expense of establishing such a plant would be incurred by the Fiat company.

LIST OF EXHIBITORS IN ANNUAL SHOW IN PHILADELPHIA

Automobile Sales Corporation—Peerless and Cadillac
Ford Motor Co.—Ford
Bergdoll Motor Car Co.—Chalmers-Detroit and Thomas
General Motor Car Co.—Lozier
Foss-Hughes Motor Car Co.—Pierce-Arrow and E-M-F 30
Brazier Automobile Co.—Marmon
Penn Motor Car Co.—Mitchell
Prescott Adamson—Columbia
W. J. Sprankle—Overland
Jackson Motor Car Co.—Jackson
Studebaker Brothers Co.—Studebaker
A. G. Spalding & Brother—Stevens-Duryea
Autocar Co.—Autocar
Matheson Automobile Co.—Matheson
Tioga Auto Co.—National and Rambler
Locomobile Co. of America—Locomobile
Chadwick Engineering Works—Chadwick
Keystone Motor Car Co.—Packard
L. E. French—Pullman
Gawthrop & Wister—Elmore
Thomas M. Twining—Regal-Detroit and Crawford
Winton Motor Carriage Co.—Winton
J. M. Quinby & Co.—Pennsylvania and Isotta
Longstretch Motor Car Co.—Maxwell
Wyckoff, Church & Partridge—Stearns
Franklin Motor Car Co.—Franklin
Acme Motor Car Co.—Acme
Hol-Tan Co.—Lancia
D. Walter Harper—Stanley steamer
Hills Motor Car Co.—Royal Tourist
North Philadelphia Automobile Station—Knox
Standard Motor Car Co.—Middleby and Speedwell
White Co.—White steamer
Stoyle Automobile Co.—American and Grout
Hamilton Automobile Co.—Stoddard-Dayton
Palmer & Singer Mfg. Co.—Palmer & Singer and Simplex
Fiat Automobile Co.—Fiat
Philadelphia Automobile Co.—Apperson
Oxford Automobile Co.—Brush and Gaeth
Carroll Power Co.—Carroll carbonic acid gas car

Atlas Motor Car Co.—Atlas
J. C. Bartlett—Woods electrics

MOTOR CYCLES

W. G. Rhodes—Reading-Standard
Daniels Motor Cycle Co.—Thor
American Motor Co.—Marsh-Metz
N. S. U. Motor Co.—N. S. U.

ACCESSORIES

Puritan Soap Co.—Soaps
Brown Auto Top Co.—Tops
Harris Tire and Rubber Co.—Harris tires
Paynter-Spitzle Co.—Anti-Skid tires
Caloris Mfg. Co.—Caloris bottles
Brietson Mfg. Co.—Brietson detachable tread
George W. Nock Co.—Supplies
Dayton Rubber Mfg. Co.—Dayton airless tires
Manufacturers' Supplies Co.—Supplies
J. H. McCullough & Sons—Supplies
Autolight and Motor Supply Co.—Supplies
James L. Gibney & Brother—Gibney tires and supplies
Auto Equipment Co.—Supplies
Keystone Lubricating Co.—Oils and greases
W-D Spring Cushion Tire Co.—Cushion tires
M. L. Snyder—Pyrene
Frank S. Avel—Avel steel tire case
Rose Mfg. Co.—Neverout lamps
Home Tire Co.—Home tires
Y. M. C. A.—School

SMALL CARS CLASH IN MIDWINTER TEST

HARTFORD, CONN., Jan. 28—A 20-horsepower four-cylinder Mitchell runabout was the sole survivor in the 156-mile endurance contest from Hartford to Pittsfield and return by way of Springfield today. The time of the Mitchell was 11 hours 52 minutes, and it is estimated that at least 20 miles more than the course described was covered, so that this time is virtually for 170 miles of running. The contest was the outcome of a challenge issued by R. D. and C. O. Britton, local Maxwell agents, to all cars selling at $1,000 or less. There were five starters, two Mitchells, two Maxwells and one high-wheeled Holsman.

Smith and his mechanic in the Mitchell nearly came to grief almost in sight of the start. The passage up Avon mountain was a bit tortuous and necessitated skill in driving. In the vicinity of Canton the Mitchell collided with a telegraph pole and for a time it looked as if the car was completely out of the running. The mechanic, who had been sitting on the running board, was pounded more or less, but was game and stuck to it. The left steering pivot was badly bent, so much so that the spokes of the wheel barely cleared it. With the wheel badly dished the entire trip was made. The second Mitchell followed the wrong road and once upon it, in a desire to make up time, halted at a tree and smashed a wheel which put it out of the contest. The two Maxwells encountered trouble shortly after the start. The car driven by King stripped a driving pinion and was towed back to Hartford and a new member installed. Later, however, it again came to grief and gave up the contest.

Macdonald in the other Maxwell was giving a good account of himself when Pine Meadow was reached, and here again the hand of fate was heavy. The car stripped a driving pinion and a complete new rear axle was hurried out from Hartford and again Macdonald started. In North Becket, however, the car skidded against a stone wall and a wheel was smashed. The crew spent the night at a farm house. A new wheel was shipped. The high-wheeled Holsman seemed to have the least trouble of all the cars entered. It had a difficult time negotiating Avon mountain in the snow and ice, as the car was equipped with only improvised chain grips. It made a consistent showing, however, until almost into Pittsfield, when a timer gear failed, which put it out.

Smith in the first Mitchell had the lead and held it. Enthusiastic testers eager to render what help was possible in breaking roads were humming along nicely. One of them collided with a bridge in Sheffield and the car was completely wrecked. Smith in the Mitchell almost lost heart as the minutes passed by and finally when it became apparent that the wrecked tester owned the bridge he took a roundabout route into Great Barrington. From this point on the contest is simply a narration of nerve on the part of Smith and his mechanic, who was kept up by stimulants; Pittsfield was duly reached after some hard going. The winning crew was dined by the Hotel Wendell and the house doctor looked over the mechanic, who proved to have been badly shaken up. Jacob's ladder still lay before the winners. Smith was urged upon to give up the idea of climbing the noted rise, but could not be argued with. The Maxwell contingent had flaunted a challenge and the Mitchell was out to win or bust. Smith endeavored to secure the services of a guide for the trip over Jacob's ladder, but the day was cold and the natives did not take seriously to offers of reward. Snow shovels were secured and the car was off. The entire run up the ladder was made on the low gear. The radiator was kept cool with snow when water was not to be had and time and again it boiled out. The engine, however, worked beautifully. At the top of the ladder, the wheels were wound with heavy rope for the descent. It was made without especial incident.

The run in from Chester to Westfield was hard going and snow drifts had to be eliminated. From this point on the journey, compared with what had already been encountered, was not so hard. Between Westfield and Chester the run was made most of the time over the trolley tracks. The Mitchell crew was given a good scare when Springfield was reached. Safe in the assurance, from inquiries along the way, that no other car had passed, the party stopped for a brief respite. The crowd from home had run up to escort the winners home, and as Smith got into his car along came King in the Maxwell. "Where did you come from?" asked Smith. "Just got in," replied King. Needless to say Smith did some tall speculating as to how quickly he could get away from King and reach Hartford first, but King confessed, and the Mitchell came over the road homeward at a leisurely pace, reaching Hartford at 6:52, after having run 11 hours and 52 minutes.

Two trophies were offered for the contest, a silver loving cup from the Hartford Times to the winning car and a copper and pewter loving cup donated by the Post & Lester Co. for the car making the time closest to 8 hours. Mitchell won them both. All the cars entered except the Holsman were equipped with Hartford tires. Despite the ice and snow and extraordinarily rough roads not a single case of tire trouble was reported.

HARTFORD MID-WINTER TEST—THE WINNING MITCHELL

HOUSE WANTS CARS FOR TAFT

Washington, D. C., Feb. 3—Special telegram—By an overwhelming vote the house of representatives determined yesterday to insist upon an appropriation of $12,000 for motor cars for the White House. The senate struck out the item and now a conference has been ordered on the subject between the two branches of congress. The matter was debated on the floor of the house for an hour and the flood of words kept the entire house and galleries in uproar. Representatives Clark of Missouri and Sims of Tennessee opposed motor cars in the White House service, while Chairman Tawney and Representative Keifer of Ohio supported them. Sims

intimated that motor cars were extremely unpopular in Tennessee.

"The motor car," declared Mr. Sims, with emphasis, "furnishes a dangerous means of travel, not only for the people who ride in it, but for pedestrians. The motor car is a genuine, all-around nuisance. I don't want to be 'chinkapiny' about this, but I am not in favor of this appropriation. I am opposed to this congress going on record favoring motor cars as a means of travel."

"Does the gentleman think the president should be required to use Tennessee mules?" Representative Mann, of Illinois, interrupted to inquire.

"Tennessee mules would be safer for the president," said Mr. Sims. "I do not want anything done here that will amount to us saying to the motor car fanatics of the country, 'We hereby encourage you.' Let us vote down this thing."

It is said that if congress will not buy the cars the president-elect will pay for them himself. It is reported he intends having a Peerless gasoline car and a White steamer, he being an Ohioan.

HARTFORD'S MID-WINTER TEST—KING'S MAXWELL ON TALCOTT MOUNTAIN

GOES OVER HOWER'S HEAD

Philadelphia, Pa., Feb. 2—The Quaker City Motor Club has appealed to the executive committee of the American Automobile Association for a rehearing of the Premier case in which Chairman Hower of the contest board removed the disqualification placed on the car by the Quaker City Motor Club in the New Year's reliability run. The brief that has been filed is under twenty-two heads. It is said that the removal of the disqualification of the Premier in no way affects the disposition of the MacDonald & Campbell cup; and that that trophy will go to the owner of the car which the Quakers decide is entitled to it.

ANOTHER BOSTON FIRE

Boston, Mass., Jan. 31—Boston was visited by another fire in a motor office last week when the salesroom, on Boylston street, of the J. W. Bowman Co., agent for the Stevens-Duryea cars, suffered a loss of several thousand dollars. The fire started in the basement and burned up through the floor. Mr. Bowman, Harry Marvin and George Canterbury were in the office at the time and they hustled out the five cars on the first floor. Next door is the Whitten-Gilmore company, agent for the Chalmers-Detroit and Thomas. As the fire began to look threatening there was a great hustling there and the six Thomas and Chalmers cars were rushed out onto the sidewalk out of danger. There are a number of motor agencies near by and from them came a horde of dealers and assistants who worked rapidly and did much to rescue the cars. In the meantime some of the men who do repair work rushed to the rear and hustled out the cars from the basements. There were about a dozen cars in the Stevens-Duryea place and four of these were gotten out as well as eight or nine in the Whitten-Gilmore place. The other cars in the Stevens-Duryea basement were not damaged much as the firemen did a good job. The fire did not get through to the Chalmers and Thomas store. The cause was given as crossed electric wires. Mr. Bowman was able to resume business after the fire, as the damage was mostly confined to the basement and walls. Temporarily he is occupying an adjacent store.

SEVENTY-TWO CARS IN DAY

Detroit, Mich., Feb. 1—On Saturday the Cadillac Motor Car Co. performed one of the most remarkable feats in the history of the motor car industry by pushing its record of production to a total of seventy-four cars inside the working day, which also included, of course, the night preceding, as the factory has been working two shifts for some time. The result was by no means a combination of several days' work, as the firm has been working at a production rate of thirty cars regularly heretofore, with but scant variation. The spurt was made in a vain endeavor to catch up with the demands of the various Cadillac distributors. All of the cars were four-cylinder Cadillac Thirties.

FIRE IN HOOSIER GARAGE

Indianapolis, Ind., Feb. 1—The garage and sales room of the Cadillac Automobile Co. at 23 East Ohio street was burned at 3 o'clock this afternoon, the loss on the building and contents being about $20,000, partially covered by insurance. Fourteen motor cars were burned, of which eight were owned by the company. An explosion started the fire. Herbert Graham and Edward Peck were filling a gasoline tank on a delivery wagon belonging to the Marrott Department Store Co. A touring car, with the engine running, was within 3 feet of the delivery wagon, when the explosion occurred. The company's loss was covered by insurance and the building will be repaired at once.

NEW CLUB IN BOSTON

Boston, Mass., Feb. 1—The Boston Motor Club is the proposed name for the new club that is being organized in Boston by men who resigned from the Bay State A. A. recently. A committee of ten was appointed and they were asked to secure at least twelve members each in order that there would be a sufficient number to start the club on a firm basis. Some of the men have secured more than the number they were supposed to get, and it would not be surprising if the organization started off with at least 150 members. Arrangements are under way to secure rooms at a hotel where the members may dine and play billiards every day.

RULES IN GAS TANK CASE

Milwaukee, Wis., Feb. 1—Judge Quarles of the United States circuit court of the eastern district of Wisconsin, sitting on the case of the Commercial Acetylene Co. against the Avery Portable Lighting Co., has handed down an opinion in which he declares the defendant has infringed claims 1, 2 and 5 of the Claude & Hess patent on improved apparatus for storing acetylene gas. The Commercial company charged infringement and Judge Quarles held that an interlocutory decree might be prepared. The Claude & Hess patent claims cover the method or process of forcing acetylene gas under pressure to a solvent for the purpose of storing and transporting gas and the other for the apparatus or package adapted to receive and store a super-saturated solution of acetylene for safe and convenient transportation.

NATIONAL BODY STARTS ACTIVE CAMPAIGN

A. A. A. Touring and Information Board Outlines Its Campaign—Plans of Good Roads Committee

NEW YORK, Feb. 1—There is renewed activity on the part of the officials of the American Automobile Association. The various committees are being made up, Chairman Hower, of the contest board, is secretly planning the route for the next Glidden, while preparations are being made for several meetings during the Chicago show. The executive committee will hold a session in the Windy City Thursday, February 11, while Chairman Neff is planning a gathering of the good roads clans some day during the week in Chicago.

Philadelphia Headquarters

The touring and information board of the national association has been opened with headquarters in Philadelphia under the direction of Powell Evans, president of the Automobile Club of Philadelphia and chairman of the touring information board of the A. A. A. Arrangements have been made with the Philadelphia club to turn over a portion of its clubhouse to the new touring bureau. Information and maps will be distributed to the 20,000 members of the A. A. A. through the affiliated clubs, numbering more than 200 and scattered throughout almost every state in the union. All of the affiliated clubs of the national body are now coöperating with the new touring board, and in this way the A. A. A. will shortly be able to give its members data and up-to-date maps on touring from sections where such information has never before been obtainable. Touring in this country has heretofore been confined to beaten paths, and even the largest motoring clubs never have found it possible to supply a member with the information he wanted if he was going a little out of the ordinary course of touring.

Scout for New Routes

Chairman Evans, and those who are associated with him, realize that many very excellent roads have been built during the past few years in parts which are still unknown to the average tourist. These roads, of course, are used by local motorists, but the man who is passing through these sections for the first time is very apt to follow the roads given in the old touring books and miss the pleasure of traveling on the new roads. Mr. Evans already has started his map makers to work, and the secretary of each club affiliated with the association is preparing up-to-date data relative to touring in the neighborhood of his club, all of which will be assembled at the headquarters of the national touring information board and ready for distribution before the 1909 touring season opens. The information which the national body gets in this way has never been possible before, and it is very likely Mr. Evans will be able to turn out some touring routes and maps which will be a revelation to the man who has been struggling many years with the average touring book.

Four large cities are now actively bidding for the national good roads and legislative convention which is to be held in the fall. C. Gordon Neff, chairman of the good roads board of the A. A. A., has received communications either in writing or through the visits of prominent citizens from Cleveland, Cincinnati, Columbus and Detroit, all urging Mr. Neff to do what he can to bring the convention there. At the meeting of the good roads board held during the show at Madison Square garden fourteen out of twenty-five states represented in the A. A. A. had delegates present, and an active campaign was mapped out for the A. A. A. good roads board during the coming year.

Desire Convict Labor

At the suggestion of Senator C. T. Lassiter, of Virginia, who outlined the method of building roads with convicts in the Old Dominion, Mr. Neff has decided to make a canvass of the entire country to find out which states employ convicts in the building of roads. This will be followed up later with an effort to get other states to use convict labor in road-building. There is a general movement throughout the country to abolish convict labor in lines of an industry where it interferes with organized labor, but in no section of the country does organized labor object to the use of convicts in the building of good roads.

Senator Lassiter and other southerners who attended the meeting assured the delegates from the western and northern states that the south through the medium of its convict labor will soon be far ahead of any other section in the United States in the matter of good roads.

The members of the 1909 A. A. A. good roads board, classified according to their states, are as follows:

New York state—Clay W. Holmes, Elmira; C. H. Benedict, Schenectady; A. H. Knoll, Buffalo; S. C. Tallman, Auburn; Frank Kateley, Mount Vernon; W. L. Brown, Syracuse.

Pennsylvania—P. A. Meixwell, Wilkes-Barre; R. P. Hooper, Philadelphia; W. W. Blake, Altoona; J. H. Weeks, Philadelphia; Paul C. Wolff, Pittsburg.

Massachusetts—W. H. Chase, Leominster; A. E. Lerche, Springfield; A. E. Bliss, Malden.

New Jersey—Joseph H. Wood, Newark; Walter E. Edge, Atlantic City; K. G. Roebling, Trenton.

Connecticut—F. T. Staples, Bridgeport; L. B. Lincoln, Willimantic; Joseph H. Brooks, Torrington; George Pope, Hartford.

Illinois—Ralph N. Baker, Springfield; S. P. Irwin, Bloomington; R. A. Whitney, Peoria; Joseph F. Gunther, Chicago.

Michigan—A. J. Brown, Grand Rapids; W. O. Dalton, Flint; Edwin S. George, Detroit.

Minnesota—George M. Palmer, Mankato; W. M. Nutting, Faribault; O. H. Haville, St. Cloud; George A. Will, Minneapolis; E. T. Winship, Owatonna.

Kentucky—G. A. Roy, Nicholasville; J. F. Ross, Louisville; Allen Read, Owensboro.

West Virginia—M. F. Giesey, Wheeling; J. Charles Mohler, Charleston; W. T. Carter, Parkersburg.

Virginia—Dr. R. A. Nichol, Richmond; Albert Morris, Norfolk; Charles Lassiter, Petersburg.

District of Columbia—John K. Heyl, Washington; Horace C. Chandlee, Washington; William D. West, Washington.

Delaware—John B. Bird, Wilmington; J. Danforth Bush, Wilmington.

Oklahoma—C. O. Blake, El Reno; C. O. Russell, Oklahoma City; Homer Needles, Muskogee; N. G. Brown, Oklahoma City.

Southern California—Fred Baker, Los Angeles; Fred Jackson, San Diego.

California—S. G. Buckbee, San Francisco; A. G. Wishon, Fresno; L. P. Lowe, San Francisco.

Ohio—N. O. Aeby, Columbus; Andrew Auble, Akron.

Means More Good Roads

Good roads legislation will be one of the most important subjects before the Wisconsin legislature. At the general election in November last the good roads amendment to the state constitution, permitting state aid for the construction and improvement of highways, was adopted by a large majority, and it is now up to the legislature to make appropriations under this amendment. The result is expected to be that Wisconsin will soon have one of the finest systems of highways in the country. It will take time to do this, but things are moving nicely toward that goal. Senator E. E. Browne, of Waupaca, Wis., chairman of the senate committee on roads and bridges, is classed among the motor enthusiasts in the legislature. Senator Browne always has done his utmost to further the interests of the owners, not to the detriment of other as important interests, however. Senator Browne has gathered opinions and suggestions from hundreds of sources, and he believes that the committee is in position to frame a bill that will satisfy every interest. One of the first objects is the creation of a state highway commission, an unpaid ex-officio body, removed from politics entirely. The plan is to constitute this commission of the following: State natural history survey, geological survey, deans of the colleges of engineering and agriculture of the state university.

Money for Lincoln Way

Washington, D. C., Jan. 30—The entire motor car world will be interested to learn that the project of constructing a splendid boulevard between Washington and Gettysburg as a memorial to Abraham Lincoln, has taken tangible shape, the United States senate having passed a resolution appropriating $50,000 to be expended under the direction of the war department in making a survey for the proposed highway. Many senators spoke in favor of the proposed Lincoln way. Senator Scott told of a famous road in Japan, which is hundreds of years old. Bordered on each side with magnificent trees, it is one of the show places of Japan. Senator Carter said that the proposed highway, extending from the homes of the presidents to the historic spot, will grow more interesting as the years go by, because all of the states would be per-

mitted to erect suitable monuments along the route. The prospects for the Lincoln way are exceedingly bright and the advocates of the project are redoubling their efforts to get congressional action on the matter. Motorists are interested in the matter for the reason that the Lincoln way would give them a touring ground second to none in the world and for that reason they are working to have the road built.

CONNECTICUT LEGISLATION PLANS

Hartford, Conn., Feb. 1—Now that the Connecticut legislature is about ready to get down to business, motorists are anxiously watching out to see what is going to happen to the present law. One bright lawyer, a member of the legislature, is credited with being the author of a measure to limit the power capability of all gas cars. It is the consensus of opinion among the legal talent that the present law is adequate, but it should be more strictly enforced. A fixed speed limit is undesirable for many reasons, and to express the matter as set forth by a well-known member of the bar, "A fixed speed limit invites the best of us to violate the law when opportunity offers." Unfortunately during the past 6 months there have been several fatal accidents, two of which have occurred in Hartford. For each offense the guilty parties are now serving sentence. It is the opinion of one faction that once the adequacy of the present law is made tangible to the legislature, its perpetuation will no longer be a matter of question. There are a good many supporters of the present law in the legislature, and of the state officials there is no more hearty supporter than Highway Commissioner James H. MacDonald, who is a national figure.

PROSPECTS IN WASHINGTON

Washington, D. C., Jan. 29—A round of the motor car salesrooms of this city brings to light the fact that the prospects for 1909 are not only encouraging on every hand, but it is confidently predicted by business men that the year just opening will be one of the greatest, if not the banner year in Washington's business history. In this prosperity the motor car dealers are sure to join, and for those who have known how to meet conditions of the past properly, who have ben able to conserve assets to the best advantage, the prospect is a distinctly happy one. The main factor on which the motor car dealer's business depends, namely, commercial optmism, is abroad, and unless all signs fail, the year 1909 will be a record-breaker in the way of sales. The latest addition to the local ranks is the Warner Motor Co., which has opened a large garage and salesroom at 1206 New Hampshire avenue, and will handle the American, Speedwell and Crawford in the city of Washington this year.

CUP FOR FUEL PRIZE

Offer of Chicago Motor Club of a Glidden Economy Trophy Accepted by the A.A.A.

Chicago, Feb. 1—Formal announcement has been made by the Chicago Motor Club that it has offered a trophy to the American Automobile Association to go to the car making the best showing in the consumption of fuel in the annual Glidden tour, which offer has been accepted by Chairman Hower, although that official has not as yet outlined his rules regarding the competition for this cup. This innovation was planned a couple of months ago, and the matter was presented to Chairman Hower at a conference during the Madison Square garden show in New York, which was attended by E. P. Chalfant, general manager of the A. L. A. M.; H. O. Smith, of the A. M. C. M. A.; S. A. Miles, of the N. A. A. M., and David Beecroft, chairman of the Chicago Motor Club's technical board.

The suggestion from Chicago met with the enthusiastic approval of the tradesmen, who recommended to Chairman Hower that it be adopted. But the announcement of the proffer of the cup was not made public at the time the rules were given out because the directors of the Chicago Motor Club had not taken formal action in the matter. This was settled at the board meeting last Thursday, after which active steps were taken to secure the trophy, which will be a valuable one and well worth the struggle, it is anticipated.

So far as the rules for this economy test go, they undoubtedly will be about the same as prevailed in the local 1,000-mile reliability last fall, in which the Standard Oil Co. trophy was put up and which was won by Ray McNamara in a Premier roadster. This was decided under the formula originated by the Chicago Motor Club and in which the result is arrived at by dividing the weight of the car and load as expressed in pounds by the weight of the gasoline consumed in ounces.

In the case of the local reliability this economy test proved a great success. The contesting cars were not tuned up to an economy pitch because of the fact that they had to do 250 miles a day for 1,000 miles. The conditions being such, the results arrived at furnished a true line on the economical tendencies of the cars under actual touring conditions. If it worked out so well here, it is argued that there is no reason why it should not produce as good results in the Glidden.

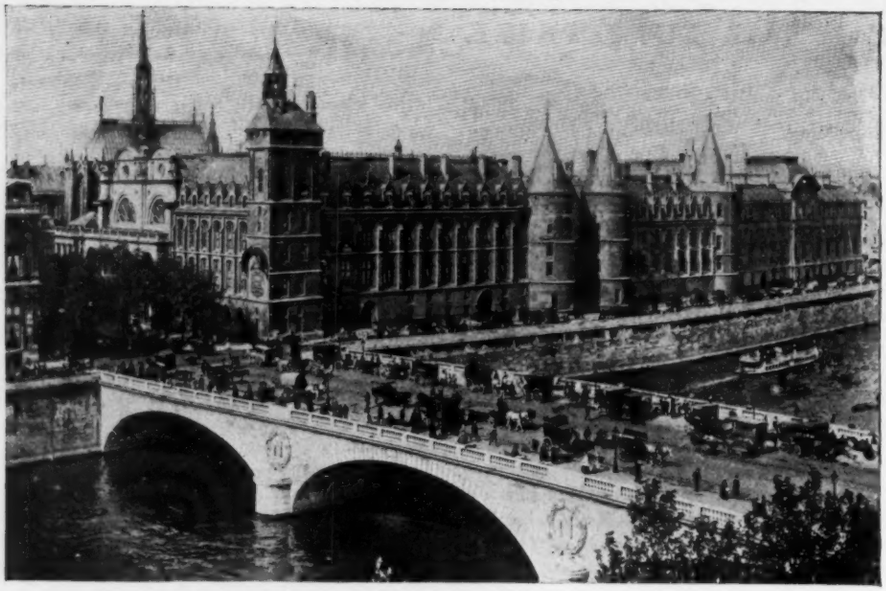
Enthused over the acceptance of this cup by the American Automobile Association, the Chicago Motor Club has started hustling to get the start of the Glidden tour, which gossip has it has been lost to Chicago because of the lack of organization in this city. Rumor has it that Detroit is the favored city, but a quiet inquiry started by the Chicago Motor Club developed that there was nothing certain about this tentative award. There were found Detroiters who unhesitatingly declared they would benefit more in a trade way to have the tour start from Chicago than from their own city, while several Indianapolis manufacturers declared they favored Chicago. So Chairman Paul Picard, of the Chicago club's touring board, has started pulling wires, which it is believed will result in the big tour starting from this city after all.

HUGHES ON MOTOR TAXATION

Albany, N. Y., Jan. 31—In his annual message to the state legislature Governor Hughes had the following to say regarding the taxing of motor vehicles: "There have been 809 miles of state roads completed during the past year. The new highway law is now in effect and provides for an improved system of administration designed to perfect methods and secure proper continuity of organization and policy. It is of little purpose to build new roads unless the roads which are constructed are also properly maintained. And in no department of the state's work are there more serious problems and greater need of the utmost efficiency. It is believed that these necessities are fully appreciated by the people and that in response to their demand we shall be able to secure a system of improved highways worthy of the state. The difficulty of maintaining our highways has been so largely increased by the use of motor vehicles that I recommend for your consideration the advisability of imposing a substantial license tax for the privilege of operating motor vehicles within the state, the proceeds to be devoted to highway repair. It is desirable that such license fee should be uniform in our state and in the states with which we are in contact, and in advance of legislation opportunity should be offered for prompt interchange of opinion and for securing an agreed basis of action. This, it would seem, might be accomplished through the commissioners on uniform laws. The reckless disregard of human life that is so frequently manifested in the driving of motor cars calls for drastic measures of protection, both with regard to means of identifying vehicles and in providing an increased punishment where those guilty of criminal conduct seek to escape arrest."

BADGER BRASS WINS APPEAL

Kenosha, Wis., Feb. 1—The Badger Brass Mfg. Co. won out in the appeal taken by labor interests to the Wisconsin supreme court in the case of the Badger Brass Mfg. Co. vs. John Daly, familiarly known as the "trades dispute injunction case." Employes of the Badger works declared a strike and the company secured an injunction against a number of Kenosha labor unions to prevent picketing. The appeal was taken by Daly on the ground that the scope of the discovery proceedings was limited by the circuit court at Kenosha without cause.



PARIS COURT HOUSE AND PONT AU CHANGE

TRAFFIC ON BOULEVARD THIRD OF MILE FROM OPERA HOUSE

BOULEVARD MONTMARTE, USUALLY ONE OF THE MOST CROWDED STREETS

Traffic Conditions

PARIS, Jan. 23—A comparison of the methods of handling traffic in vogue in Paris and Chicago, for instance, produces interesting results, and Americans believe the French idea is well worth emulating. As differing from conditions found in Yankee cities, it is astonishing to see the street car tracks used by street cars only. In the United States it is the custom for drivers of business rigs to take to the tracks at every opportunity. In Paris it is just the other way. A teamster or a motor car driver found trespassing is stopped by a policeman and given a "contravention," which is equivalent to a fine.

It is seldom, however, that the guardian of the peace interferes. It is only when there is a sudden congestion at a street intersection, or when there are attempts to cross in front of moving cars, that the policeman steps in. Motor cars are driven through the crowded streets nearly as fast as if they were in the open country; but there are fewer accident where drivers are permitted to go fast and use their own judgment than where the speed is restricted and the pilots sprint at unexpected times. This state of affairs is possible because now the general public is becoming educated to the motor traffic of Paris. It knows how fast the cars are being driven, and it realizes it is up to the pedestrian on the street or the walk to be on the lookout for possible accidents. While accidents continue to occur, and always will, notwithstanding the care taken, it is believed that considering the unequaled traffic conditions in the French capital, accidents due to street traffic—not railroads—are few compared with those in the average American cities.

No accurate figures are obtainable as to the number of vehicles daily on the streets of this great city, but it is estimated that at least 8,000 motor cars of all kinds, and including about 3,500 taxicabs. are on the streets. It should be remembered that the space within this boulevard loop system does not include one-half of Paris. It embraces a section of the city that compares in size with the loop district in Chicago. The boulevard system begin at the place de 'l Opera and takes in on one side the boulevard des Italiens, boulevard Montmarte, the boulevard Posionniere, the boulevard Bonne-Nouvelle and the boulevard St. Denis. On the other side are the boulevard des Capucins and others. Along all these boulevards are lined up strings of taxicabs.

At night all vehicles carry lights front and rear. Up to 9 o'clock in the evening the traffic on the boulevards is very heavy because of the crowds going to the theaters. Then there is an intermission until 11:30 or 12:30, after which time one may venture to cross the street at any place without police assistance until 8:30 or 9 o'clock in the morning, when the traffic again becomes heavy and at noon it is in full swing. There is a lull at the lunch hour.

In French Metropolis

It is generally conceded that the business center of Paris is the place de l' Opera, which is the square in front of the opera house. On this square also begin the boulevard des Italien, the rue de la Paix and half a dozen other important streets, while within a radius of less than half a mile are located several of the most important hotels, the board of trade, the largest bank in France, half a dozen leading theaters, restaurants and cafes. Naturally on the boulevards, starting with the boulevard des Italiens, the traffic is greater, but this is mainly due to the fact that the taxicabs are stationed all along the boulevard system. For any human being to try and cross the boulevard at any place except where the policemen are posted and where they signal the vehicles to stop or go ahead is foolhardy and risky. It is said that statistics show that more than half the persons run over and hurt in Paris are injured crossing at points where there are no policemen on guard.

Unlike Chicago, the bulk of the vehicles are not commercial rigs and street cars. Big teams hauling tons of goods are unknown sights in the capital of France. The bulk of the vehicles are the taxis and horse cabs; then come the pleasure motor vehicles, the horse-drawn buses, the motor buses, motor-driven commercial vehicles, tricars for delivery purposes and bicycles. Of the last named a small number are to be seen on the boulevards and in the main streets leading to the boulevards, because it is extremely dangerous for cyclists to venture among the heavy traffic.

Motor omnibus service is still in its infancy in Paris. This is said to be due to the fact that no permits can be obtained for streets where horse-drawn buses ply. The few lines operating motor buses are doing well. At least it looks so when one sees how crowded they always are. The Parisian and the fair Parisienne are far more orderly and willing to abide by circumstances than Chicagoans or New Yorkers. In Paris when a bus contains the number of passengers for which there are seats and the number allowed to stand on the dirty platform the conductor puts out the sign: "Complet," which means full; then no one attempts to get in. In America the same bus would be considered just about half-filled. There are straps and nobody hanging on to them, and four or five people on either side are sitting almost as comfortably as if they were at home.

For the convenience of the public and the conductors numbered tickets are provided at the regular stopping places. Every different line has its tickets. When the omnibus arrives and there are five seats and ten persons wating, the conductor takes the tickets with the lowest numbers and calls for the holders, who get on the bus, while those with the higher numbers must wait till the next bus comes.

MOTOR BUS IN OPERATION ON PARISIAN STREET

BOULEVARD POSIONNIÈRE AT A QUIET TIME

STREET SCENE IN FRONT OF OPERA HOUSE, PARIS

The Readers' Clearing House

EDITOR'S NOTE—In this department Motor Age answers free of charge questions regarding motor problems and invites a discussion of pertinent subjects. Correspondence is solicited from subscribers and others.

HORSEPOWER RATING

WINNIPEG, CAN.—Editor Motor Age—In Motor Age, issue January 21, is given the A. L. A. M. method of rating horsepower. By that method the stroke is not taken into consideration; or, in other words, an engine having a 4-inch stroke would give the same horsepower as one with a 5-inch stroke. Will Motor Age give an explanation of this? Also state what a horsepower is.—H. D. G.

You are correct in your assumption that the A. L. A. M. formula for determining horsepower does not take into consideration the length of stroke. The formula is a convenient one for arriving approximately at horsepower rating, but it would be folly to think that the motor you mention with a 4-inch stroke would give the same amount of power as one with a 5. The A. L. A. M. formula has proven particularly valuable in the past, but within the last year, since the great tendency toward long strokes has arisen, the shortcomings of the formula have become more and more apparent. It must not be understood, however, that the formula was ever intended to be an absolutely correct one, but rather an easily-obtained and approximately accurate one for motors in which the stroke or medium stroke predominated. A horsepower is a unit of calculating power and is equivalent to raising 33,000 pounds 1 foot in 1 minute, or 1 pound 33,000 feet in 1 minute. There is an electrical equivalent also. In calculating the horsepower of a gasoline motor the piston area is taken into consideration together with the force of the explosion which bears upon the piston head.

HORSEPOWER OF PACKARDS

Bardstown, Ky.—Editor Motor Age—Will Motor Age answer the following through the Readers' Clearing House? What is the actual horsepower that the Packard Thirty and Eighteen develop? As the Pope Mfg. Co. is reorganized, does this include the Toledo factory? What month is the route of the Glidden tour decided on by the contest board of the American Automobile Association? Has anything definitely been done for next year's route?—Claude W. Wilson.

According to the A. L. A. M. formula the Packard Thirty with 5-inch bore would be rated at 40 horsepower, but it is evident that because of the longer stroke it generates much more than this, perhaps 30 per cent more at 1,000 revolutions per minute. The Eighteen model is rated at 36.1 horsepower under the formula. The Pope reorganization applied to the general Pope interests, and the Toledo factory has been sold, as told in these pages last week. In all probability the route of the 1909 Glidden tour will be decided within a fortnight. It is expected that Chairman Hower, of the contest board of the A. A. A., will announce the route soon after the Chicago show. Nothing definite has been done on next year's route other than deciding that it will take place in the west, and that in all probability it will start from Chicago.

GEAR RATIOS FOR RACING

Council Bluffs, Ia.—Editor Motor Age—Will Motor Age please state in what ratio the engine of the Fiat racer which made 121 miles an hour on the Brooklands track was geared to the wheels? How fast can a reciprocating gas engine be made to run as a working proposition? Can an electric motor rated at 75 horsepower run as fast as the above mentioned Fiat, or as Robertson's Locomobile, or as the winner of the last Savannah race driven by Wagner? What is the usual gearing of such racing cars as these?—John W. Brooks.

The gear ratio of the Fiat racer is not known, but would be one-to-one, or perhaps higher. A reciprocating gas engine can travel with a piston speed as high as 2,400 feet per minute. In a 6-inch stroke motor this would mean a crankshaft speed of 2,400 revolutions per minute. Very few motors can attain anything like this speed, and with the majority of American four-cylinder cars a speed of 1,500 to 1,800 piston feet per minute is very high. A 75-horsepower electric motor fitted in an electric car should be able to make speeds much in advance of the Fiat or Locomobile, as electric cars with low motor power have made high speeds on the Florida coast. Racing cars are geared to suit the course. If it is a tortuous course, with frequent turns the cars have been geared as low as two-to-one, in order to speed up fast. On courses with long, straight stretches gear ratios one and one-tenth-to-one are common.

A TWO-CYCLE TROUBLE

New Orleans, La.—Editor Motor Age—I have a 2½-horsepower two-cycle marine engine and the crankcase has been cracked. Although it has been repaired the engine will not run. The compression is good and spark and coils all right. Turning the flywheel around about one-half turn backward and forward results in one explosion only. Would a small leak in the crankcase cause this? It would seem to me that even with a small leak in the crankcase we should get more than one explosion out of the mixture.—Arthur Blanchard.

It is difficult to state whether or not the crack in the crankcase is responsible for your trouble. This could be answered better by knowing the exact nature of the explosion you get when you rotate the crankshaft backward and forward, or a half rotation. If the explosion is weak and of a thin nature it may be due to the leak, or at best to not enough mixture reaching the combustion chamber. On the other hand, if the explosion is good, heavy and strong, and you only get one, the trouble is you are feeding too rich a mixture and the remedy lies in changing the adjustment of the carbureter. The proper course to pursue is to work on your carbureter adjustment according to directions given with your carbureter. Should these not prove effective it will then be proper to conclude there is a leak and the explosion will be of the weak spitting nature mentioned.

QUESTION OF POWER

Victor, Mont.—Editor Motor Age—How much stronger is a 4 by 4-inch opposed engine than a 5 by 6-inch single cylinder? Also will Motor Age let me know who makes the Hyatt flexible roller bearings used on motor cars?—L. Lacoursier.

A 4 by 4-inch two-cylinder opposed motor has a rating of 12.8 horsepower and a single-cylinder motor with 5 by 6-inch cylinder is rated at 10 horsepower. In this rating no regard has been taken of the stroke of 6 inches in one motor which should result in more than 10 horsepower. It is to be expected also that the 4 by 4 size will be a much higher speed power generator than the single-cylinder one. The Hyatt bearing is manufactured by the Hyatt Roller Bearing Co.

SPEED OF ENGINES

Lockland, O.—Editor Motor Age—Can Motor Age tell me, through the columns of the Readers' Clearing House, what would be the best speed to get from a 4½-inch bore and 5-inch stroke opposed motor? The best I can get is between 800 and 900 revolutions per minute. How much compression space is advisable in proportion to the stroke? I have about 1 inch space now. Would I get more power by making the compression space smaller, or would it make the motor work jerky? How am I to get more speed and power? Also tell me how much compression I ought to get from the motor. Can Motor Age give any information on winding the armature of magneto? Is Tobin bronze a good metal for crankshaft bearings, or will it heat?—A Subscriber.

Nine hundred revolutions per minute is only a piston speed of 750 feet per minute and there is no reason why a motor of

these dimensions should not give double that speed. Increasing the compression will add to the speed and you should be able to use 70 pounds to advantage. Higher speed could best be obtained by using larger-diameter valves or by an increase in the valve lift. Motor Age published on page 27, issue of October 8, 1908, information on winding a magneto armature.

ONLY ONE ACCEPTED FORMULA

Boston, Mass.—Editor Motor Age—Recently a salesman of the Boston agency of the Packard Motor Car Co. told me the rating of the Packard Eighteen is 36 according to American rating. When I asked him if he didn't mean 26 by A. L. A. M. rating, he said while that rating was correct, yet the American rating called for 36. I never heard of American rating. Is there one? If so, who is the formula employed?—Subscriber.

The only accepted American formula for horsepower rating of gasoline motors is that adopted by the A. L. A. M. to which you refer.

SIMPLEX ENGINE RATING

Syracuse, Neb.—Editor Motor Age—Through the Readers' Clearing House will Motor Age state the size of the motor used in the Simplex car which figured in the grand prix race at Savannah; also give the bore and stroke, number of cylinders and the rated horsepower of the Simplex.—W. C. Lambeth.

The Simplex is rated at 50-horsepower and has a cylinder bore of 6.1 and stroke of 5.75.

SMALL PROGRESS ON NEW MOTOR

LaSalle, Ill.—Editor Motor Age—What has become of Lougheed's new cycle motor, described in Motor Age some time ago? Theoretically, it seemed such a good thing that we expected to hear of it again after reading about it.—Reader.

Motor Age understands that the manufacture of the Lougheed cycle motor was contemplated but has not any information as to what progress is being made.

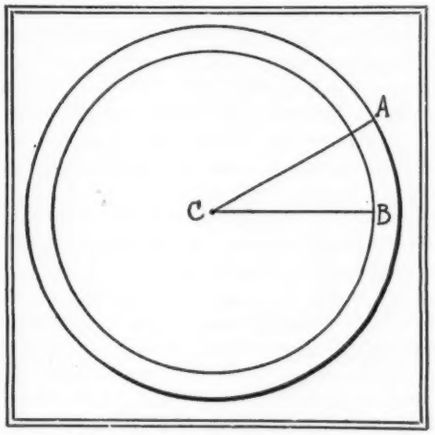
THE TWO-CYCLE MOTOR

Murray, Ia.—Editor Motor Age—Through the Readers' Clearing House, will Motor Age tell me why so few motor car companies use two-cycle motors? Will a 20-horsepower two-cycle motor develop as much power as a four-cycle 20-horsepower? What great advantage has the four-cycle over the two-cycle?—W. M. Clark.

A 20-horsepower two-cycle motor would give the same power as 20-horsepower four-cycle, else why would each be rated at 20 horsepower? A four-cylinder, two-cycle with 5 by 5-inch cylinders will not give twice as much power as a four-cycle of the same size, although the two-cycle has double the number of explosions at the same crankshaft speed. The advantages claimed by makers of four-cycle engines for their products as compared with two-cycle types is better scavenging of the exhaust gases and fuller charges of intake mixture. The great advantage of the two-cycle motor is its simplicity, it being without valves, camshafts and the many valve-operating parts. The reason so many makers have followed four-cycle construction is that it attracted attention, at the start, and was taken up by the many big makers who have not dropped it, doubtless because they did not care to go pioneering in the two-cycle field.

ASKS ABOUT FRICTION

Gowrie, Ia.—Editor Motor Age—Seeing that there has been more or less comment lately on the merits of the friction drive and being particularly interested myself, I take the liberty of submitting the following: Let C and A represent the center and periphery of the friction disk. The face of the ordinary friction wheel is about 1½ inch broad, so if its outer



BABCOCK'S FRICTION DRIVE DIAGRAM

edge touched the disk at A the inner edge would touch, say at B. If the disk is 20 inches in diameter the line C A would be 10 inches and C B 8½ inches. This would mean that one edge of the friction wheel would be supposed to travel nearly 63 inches while the inner only travels 53½ inches, or a difference of nearly 9½ inches for each revolution of the crankshaft. This would equal the straight slipping of 4¾ inches. On the small machines, geared at three to one, it would mean that there is enough power wasted at every revolution of the rear wheels to carry the machine approximately 28½ inches. This is in addition to the natural slipping between friction wheel and disk, the two bearings on the disk shaft, the big thrust bearing and the two bearings on the jack or cross shaft. In the ordinary chain-driven machine there is nothing intervening between the front and rear sprockets; in other words, it does away with the friction disk and wheel with the four or five bearings. Will some of the readers of these pages tell me where the advantage lies in the friction drive? While it is true that the old planetary gear is noisy, and there is a loss of power on low gear, yet how many miles out of a thousand do we travel on the low with the late cars, and when in high gear there is no loss through the transmission?—D. O. Babcock.

DIFFERENCES IN TRANSMISSIONS

Hartford, Mich.—Editor Motor Age—Through the Readers' Clearing House, will Motor Age please explain the difference between the selective and progressive types of transmission? Also what is meant by planetary transmission? Which of these modes of transmission is considered the best and easiest to operate? Are the selective and progressive transmission both sliding gears?—H. & D.

The difference between a selective and progressive gearset is as follows: In a progressive set there is only one set of gears that slides and in a selective set there are always two sets and sometimes three. In the progressive set the sliding unit may consist of three gears all rigid together, one being for direct drive, another for intermediate speeds and the third for slow speed and also for reverse. These sliding gears are generally on the mainshaft. The gears have one neutral point and are moved backward from this for reverse speed. Moved forward it gives, respectively, first, second and high speeds. Going from neutral to high you must move into second, and from it go to high. Dropping from high to reverse you must pass through intermediate and low. You cannot go direct from high to reverse. In a selective set you can start on low, and immediately jump to high or third, without bothering about going through second speed. Then you can go direct from high to reverse without passing through intermediate or low. These direct changes from any speed to any other are made possible by the use of two or three sliding sets. A planetary gearset is one in which the gears are carried in a cylindrical case, and in which the gears are always in mesh and in which on indirect drive the gears move in planetary relation to one another.

A JACK FROST MYSTERY

Eugene, Ore.—Editor Motor Age—Will Motor Age please explain to me the reason for a mishap to my motor from the following circumstances: I have a four-cylinder Rutenber motor and recently, before an approaching freeze, I ran the car into my garage and carefully drained all the water, as I supposed, from the circulation system. I was careful to take the radiator cap off to facilitate drainage. A few days later after the freeze I started to use the car and found two waterjackets cracked. The cracks are along one side of the upper shoulders of the waterjackets of the two middle cylinders. Now, could an air lock so hold water in the jackets so that the expansion of freezing would not force it on out through the drain, or could an air lock hold water at all? In short, where did I bungle things, and what procedure

would you advise under similar circumstances in the future?—Webster Kincaid.

In the Rutenber motor the water from the radiator enters the jackets at the top, close to where the exits are, there being vertical partitions in the jacket spaces to enforce circulation. It may be you attempted to drain off entirely from the base of the radiator or at the pump, and if so you failed to draw any of the water out of the jackets. On each cylinder, however, is a pet cock at the lowest jacket point, where all the water can be drawn from the jackets.

INDUCTOR TYPE OF MAGNETO

Erie, Ill.—Editor Motor Age—Through the Readers' Clearing House will Motor Age state whether or not the inductor type of magneto, such as the Schebler or Ford, is patented? Where can magnets be purchased such as are used in magnetos on motor cars?—E. L. Muesse.

Several patents are held on the inductor type of magneto, these patents covering the use of different numbers of wings carried on the inductor-shaft. One maker has a patent on two wings, another holds a patent on four and another on six. Motor Age is not aware as to whether patents are held by any party on the use of inductor vanes or wings on the shaft instead of a winding, but thinks that no such patent exists at the present time. The principle is an old one, and only the adaptation new in its application to magnetos.

ASK ABOUT MAGNETOS

Madison S. D.—Editor Motor Age—In the January 21 issue of Motor Age there is a reply to J. W. McCorkle's query, which gives the advantages of a high-tension magneto over a low-tension. It is stated that the former is much better because it enables the manufacturer to use the jump spark instead of the make-and-break. However, I would like to have Motor Age explain the differences and advantages of one over the other when employed in the jump spark system. In that case, of course, the low-tension magneto would employ the regular timer and send its current through a coil. It is a question in my mind whether the simple low-tension even with the coil and timer is not simpler and less liable to get out of order than the complicated high-tension magneto in the hands of an amateur.—H. H. Frudenfeld.

As previously stated in these columns, the high-tension magneto being a self-contained system is considerably easier to attach to a car than the low-tension outfit in which a step-up coil is required and which coil is carried on the dash. This simplification is particularly apparent where a single system is employed such as used on Franklin cars. Where a dual system is used the greater simplicity of the high-tension magneto is not so apparent, especially if a single-unit coil has to be carried outside of the magneto for the battery part of the system. The makers of high and low-tension instruments have various advantages they put forth for their respective magnetos and what appears simpler to one buyer may savor of complexity with another.

IGNITION LITERATURE

Springfield, Mo.—Editor Motor Age—Can Motor Age tell me where I can secure a treatise on magneto ignition, something that will give the principles involved? I have several general books on motor car management, namely, Whitman, Lougheed and one other, but none of these are specific enough on the magneto question to satisfy me.—C. E. Fulton.

A specially valuable book on magneto ignition is "Motor Ignition Appliances," by T. H. Hawley. This book deals solely with ignition specialties and illustrates and describes all of the features in connection therewith.

BLAME IT ON WIRING

Aurora, Mo.—Editor Motor Age—In the Readers' Clearing House communications I notice a great many readers claim to have trouble with the engine misfiring when running at high speed, but which fire regularly at low speed. Motor Age seems to attribute the cause to improper adjustment of the carbureter. In my opinion the trouble is caused from the secondary wires being too small and it seems perfectly plausible. I have been told by expert electricians that an electric wire, when electricity passes through it, is similar to a water pipe when water is passing through it—a small pipe will admit the passage of a small amount of water through it very easily, but when a larger amount is needed than will pass through, the recipient will be lacking just that much and a larger pipe will be necessary to supply the required amount. I believe the conditions are identical with the current from the coil box. On high speed the current does not get through the wire in quantity to make a spark that will ignite the charge and the trouble will be identical with that of a weak battery. If I am off the wire on this idea I hope Motor Age will so state.—E. W. P.

WANTS GLIDDEN TIRE TEST

Syracuse, N. Y.—Editor Motor Age—In the rules as announced for the coming Glidden tour there has been an omission of importance from the list of penalizations. This is in the matter of tire troubles, which have not been taken into consideration in making up the regulations. Yet tire troubles are the cause of 90 per cent of the road stops of the average motor car. The man who is interested in cars and motoring wants to know how much trouble he is likely to have with his tires as he does with any other part of the car; in fact, he needs to be more certain of the tires, for when he is out on a run the first thing he knows he finds himself stranded with a flat tire, and he must wait for repairs. Some other defect could go perhaps until he reached a convenient stopping place, but not the puncture of a tire. In contests like the Glidden tour penalties should be imposed for tire troubles. They are to a considerable extent the result of heavy construction, and poor material accounts for more. They should be judged like any other part of a motor car, for the endurance and reliability of the vehicle are dependent just as much, or more, upon them as upon the various parts concerning which penalizations are scheduled. It might be a good plan to farther extend the scope of the list of penalties and make it cover batteries. As in the case of the tires there is no reason for overlooking battery defects and failures while the perfection that endurance and reliability contests are intended to demonstrate is required of all other parts. Batteries are on the wane, magnetos taking their place, but if they are used they should be made to stand the test. The Glidden tour is a reliability test and an important one, and it is intended to demonstrate accurately how much trouble of any and every kind the motor cars entered have. If it fails to do this in any degree it fails to that extent short of its purpose; every point should be covered. Those in charge of endurance tests have of late been working toward greater rigidity of requirements. They have been sending the contestants over hard roads, purposely chosen to secure the weeding out of as many entries as possible before the technical committee is asked to give a ruling. The time is not far distant when in competitions like this the whole structure of the car will have to show that it can stand the strain or a penalty be imposed for its defects.—H. H. Franklin.

ENCASING SIDE CHAINS

Toronto, Can.—Editor Motor Age.—Can Motor Age give me any suggection through the Readers' Clearing House how I can encase the chains on a side chain-drive car to keep the mud and dust from them?—H. J. Collins.

The encasing of side chains is a very difficult matter so difficult in fact that only one or two American makers have attempted to regularly equip chain cases. Perhaps the simplest form of case for you to make would be a leather one. Every chain case must be supported by semi-circular supports one at each end the rear one slightly larger in diameter than that of the sprocket and the front one with a similar proportion to the jackshaft sprocket. These supports must be carried from stationary axle parts. Once the supports are designed and attached arrangements must be made to allow of a telescopic action in the case rendered necessary because of the varying lengths for adjusting the chain. A door should be provided near the forward end to allow of oiling the chain. Supporting strips of metal between the semi-circular end supports of the case should be used to prevent the case rubbing against the chain.

Legal Lights and Side Lights

DECISIONS ON TIRE CHAINS

THE question of using chains on the wheels of motor cars while in the parkways under the jurisdiction of the Metropolitan Park Commission of Massachusetts has created a great deal of discussion of late in Boston. The commission passed the regulation some months ago under the authority of the legislature allowing it the right to make reasonable regulations. The claim made by the commission is that in winter when there is snow the motorists going over a road get into a path and one car after another holds to this, resulting in wearing through the snow and cutting two furrows in the surface of the road. However, the regulation is in force all the year round, and this contention may not be held in the summer, when the chains are used because the roads are slippery.

In the last couple of weeks there has been some court decisions that have perplexed the Bay state motorists a great deal. Judge Bruce in Malden had several cases before him and some he placed on file, because he said where there was snow and ice on the ground the chains were not touching the road so could not harm it, the intention of the commission being to have the road saved from harm.

Judge Wentworth, of Somerville, in giving a decision on the cases held that the rule was a reasonable one, as much so as that preventing heavy traffic. Out in Dedham Judge Grover decided a couple of cases against the motorists because they pleaded guilty. However, there is coming up there a contested case, and an attornew is coming over from New York to assist Thomas R. P. Gibb, the Boston lawyer, handling the case. The New York attorney handled the cases where the same regulation as applied to Central park was declared unconstitutional by the supreme court.

Judge Johnson, of Woburn, has gone even further than any of the other judges, for he states that the rule is clearly unreasonable and he refuses to grant summonses for violations. The present regulation reads much differently from the older one, for it says no chain or rope of metal may be attached to any wheel of a vehicle.

Attorney Gibb in handling some of these cases brought out the fact that if a car was ditched, that it would be a violation of the ruling to attach anything to the wheel of the machine to pull it out of the ditch. Some of the judges held that such was the case and discharged defendants. Under the old regulation it read that the metal should not come in contact with the road.

The Boston park commissioners have not passed any such rule, and therefore the motorists find themselves perplexed. for they do not always know where the Boston park ends and the Metropolitan park begins, for it would take a map to study it out.

When the case was argued in New York while primarily it was decided on the question of whether the New York city park commissioners had the right to make the rule, one of the judges in the upper court said, that as the motorists put the chains on to prevent skidding, which was therefore a device to protect the motorists themselves, as well as the public, because a skidding motor car was dangerous, no commission had the right to pass regulations which would put people's lives in jeopardy or prevent the applying of a safety device. The Boston motorists who have contested their cases take the same view, and for that reason they have been puzzled because of the different rulings of the courts.

The Metropolitan park commission has not taken any action on the matter as yet. That the matter will come before the board when it meets again seems certain, for one of the members of the commission while riding down town one morning recently was earnestly discussing with a companion the decision of the judges in the matter of chains.

Meanwhile some of the motorists take chances of smashing their cars and injuring themselves rather than be adjudged criminals, while more of them think it is cheaper to take a chance and pay a fine. The result now is that in some parts of the parkway a motorist may use the roads with chains while in others they may not, according to the local judges. But it would take a map to find out which are the safe and which are the danger zones.

JERSEY EVIDENTLY REPENTS

That Governor Ford, along with numerous other Jerseymen, has seen the error of his state's ways in the treatment of motorists generally, and Pennsylvanians and New Yorkers in particular, is manifest from the tenor of that portion of his last message to the legislature which has to do with the motor car and its government. "The motor car," says his excellency, "is with us, and it has come to stay. It must be given all highway rights, under proper restrictions to protect the public and the occupants of the machine."

The governor hands the grangers a severe jolt when he brutally says: "All vehicles upon the public highway should be compelled to carry lights," and still further shows his contrition for the state's misdeeds by declaring: "Speed regulations in the open country should be liberal; 30 miles an hour could be allowed there with safety." Further along he says: "Arrest and trial should not be summary; the right to stop should only exist to inquire as to the possession by the driver of the machine of the requisite authority, or to obtain its number, if violation of the law be claimed. Suit should only be instituted by direction of the department in proper courts near the residence of the alleged offender, or at convenient points within the state for the non-resident. Willful injury to person or property by the driver of a car, or such injury by an intoxicated driver should be a misdemeanor, and punishable accordingly, without, of course, the loss of right to maintain a civil suit by the injured party or the owners of the damaged property." Concerning the present license fees he says they are not excessive, and should not be reduced, "unless it be through some system of uniform legislation between the states."

WOULD INCREASE FEES

The state of Wisconsin may charge $2 for motor car registration, with an additional fee of 50 cents each year for reregistration, instead of $1 for initial registration and no fee for renewals as at present. The secretary of state, whose department is in charge of the matter, is framing a measure to be presented to the legislature, now in session, to increase the fees and thus throw the burden of the support of the sub-department on the owners themselves. It is interesting to note that the promoters of the new measure say that the inadequacy of the present laws is due to the conservatism of the legislature that enacted the statutes, believing that the horseless vehicle was a fly-by-night thing, and never dreaming that any such number of cars would be in use in Wisconsin as are now being operated. As there is no charge for renewals, and a fee of only 50 cents for transfers of licenses, and there are now in use nearly 7,000 cars, the secretary of state points out that this involves a great amount of work for which there is not nearly commensurate compensation. The plan in effect is to license the owner rather than the machine itself. Milwaukee owners do not consider $2 too high, and it is believed that there will be little opposition to the proposed measure from the clubs of the state.

PRACTICAL IDEAS IN AUTOGENOUS WELDING

EDITOR'S NOTE — Tho following paper on "Practical Ideas in Autogenous Welding" was prepared by Henry Cave, of the Society of Automobile Engineers.

ONE of the first practical considerations which I wish to bring forward in connection with this subject is the pronunciation of the word autogenous, which is given in the Standard dictionary as "aw'-todj'-e-nus," but which generally seems to be construed "auto-genous" by those not familiar with the word. I, therefore, think the technical papers should accent it, until it is better known.

It is not generally known that three distinct types of torches have been invented for oxy-acetylene welding. These are termed respectively low, medium and high pressure, taking their name from the relative pressure under which the acetylene is used. The high-pressure torch was never introduced into this country, owing to certain disadvantages finally causing the medium pressure torch to be brought out. What is really the medium pressure torch is therefore known in this country as the high pressure and will be spoken of as such in this paper.

The Low-Pressure Torch

The low-pressure torch was invented by Edmond Fouché, and its principle is based on that of the injector, the acetylene being drawn by suction produced by the flow of oxygen, which is under pressure. The acetylene is brought to the torch under a pressure of a few ounces per square inch only. The flow of oxygen is regulated by the area of a nozzle and by its pressure so that the correct proportion of acetylene is sucked in. The mixture then passes out at the burner or tip of the torch. The size of the orifice in this tip is of great importance, as it controls the resistance in the mixing chamber to the flow of oxygen, and therefore controls the proportion of the two gases.

As is well known, the amount of fluid sucked by an injector is proportional to the square of the velocity of the propelling fluid. It is, therefore, essential that the flow of oxygen should not vary or the proportion of acetylene would not be constant. For the low-pressure torch this proportion is 1.7 oxygen to 1.0 of acetylene by volume, at atmospheric pressure and any variation in either direction will produce either an oxidizing or carbonizing flame. The flame should, therefore, be carefully watched as the orifice in the tip may be expanded by the heat being deflected onto the torch, or it may be contracted by particles of metal adhering to the tip, thus changing the mixture. Owing to the fine adjustment of the injector parts, these torches are often made without any means of varying the size of the flame, it being necessary to disconnect the torch from the hose and substitute another one, when it is desired to do this, a number of torches being required if it is necessary to weld on all classes of work.

Owing to the low pressure, the speed of the issuing mixture is very little above the speed of the propagation of the flame and back fires frequently occur; the gas has then to be turned off, lighted again and the mixture readjusted. The ordinary acetylene lighting generator supplies gas at a pressure suitable for use with this torch. In France, the use of this torch has been largely superseded by the high-pressure torch.

The High-Pressure Torch

In this torch, both the acetylene and oxygen are under an appreciable pressure, which results in a constant mixture under all conditions, the proportion being 1 of acetylene to 1.3 of oxygen. The mixture is regulated by holes at the inner end of the detachable tip, Fig 1. and is not affected by any variation at the outer orifice. The pressure of each gas is kept constant as required by adjustable reducing valves in the pipe lines. The torch can, therefore, be extinguished and lighted again any number of times after once adjusting the mixture, without any attention having to be given to the condition of the flame. The tips being detachable, and five, of varying capacity being supplied with each torch, allows a considerable range of work to be carried out without changing torches. Owing to the high pressure, there is very little trouble from flashing back, the speed of the gases being well above that of the propagation of the flame, back fires only resulting from touching the metal with the torch, or from the heating of the torch by the flame being deflected back onto it. This torch receives its acetylene from a special acetylene pressure generator, which produces gas up to 15 pounds pressure, and whose action is entirely automatic. Dissolved acetylene can be used with this torch, a special high-pressure reducing valve being required. This equipment is very useful, owing to its portability, where the work cannot be brought to the plant, but owing to the increased cost of acetylene under these conditions it is not so economical as the generator for regular use.

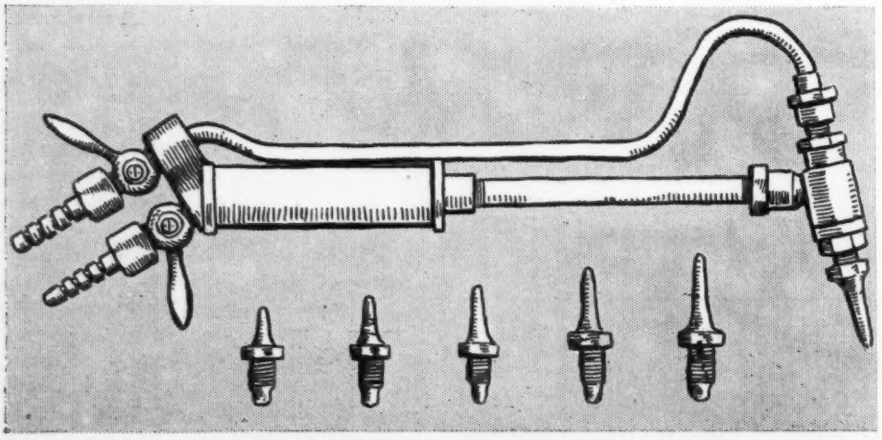


FIG. 1—HIGH PRESSURE TORCH USED FOR OXY-ACETYLENE WELDING

Acetylene and Its Nature

One of the principle rules that apply to the generation of acetylene is that the "excessive production of heat during generation must be guarded against." This is owing to the fact that excessive heat tends to change the chemical character of the gas due to its conversion, to some extent, into oily matters, which result in a reduction of the amount of gas produced and also cause trouble by clogging up pipes and burners.

The way to avoid this is to generate the gas by what is termed carbide feed; that is, by dropping the lumps of carbide into a large volume of water—a gallon of water to every pound of carbide is recommended—which does away with any possibility of heating, and in addition, the gas bubbles up through the lime water, which thoroughly washes it. The lime of course being the residue from the carbide and the solution produced is the best possible cleanser for acetylene.

Water feed generators should be avoided, as it is impossible to obtain cool generation by this method and the washing feature is lost. The lumps of calcium carbide should not be too small or they will rest on the surface of the water and the above advantages will be lost, also the larger surface results in increased air slacking taking place, which reduces the amount of gas produced per pound. Too large carbide, however, gives irregular generation with considerable variation of pressure and allows the interior of the lumps to heat up. What is called nut carbide—1¼ inches by ⅜ inches—is most suitable, taking everything into consideration, and this gives 4½ cubic feet of gas per pound of carbide. All measurements of gas, whether acetylene or oxygen, are taken at atmospheric pressure. Dissolved acetylene can be obtained in cylinders, of the capacity as shown in Table I.

Regarding Oxygen and Its Source

The source of oxygen supply is a question which requires careful consideration for each individual case separately. It can either be generated at the plant, or can be shipped in steel cylinders from one of the several companies who are generating and compressing it. The points to be considered in this proposition are:

First—The cost and transportation charges for the compressed gas and of the cylinders.

Second—The quantity of gas, and therefore the number of cylinders that would be required to contain it.

Third—The regularity of the consumption, depending on the regularity of the work, and also of its size.

Fourth—The cost of generating the oxygen at the plant.

The first depends upon the locality and shipping facilities, as well as on the quantity of gas that will be used.

The second also depends on the first, with the consideration that the cost of cylinders might equal or exceed the cost of the generating plant.

The third might necessitate the generation of oxygen at the plant, anyway, particularly if repairs were the principal work carried out, as unless the supply of work was regular and all of small size one could not depend on keeping a sufficient supply of oxygen on hand, and this class of work is generally required immediately, and cannot, therefore, wait for shipments.

The fourth depends on the quantity of chemical that could be bought at a time and the cost of their transportation, and also on the amount of establishment charges that would be figured in.

In a recent article on the subject in one of the technical journals the price at which the chemical could be purchased to make oxygen by the chlorate of potash and manganese dioxide process—which is by far the most suitable for small equipments—was given as 8 cents per pound, and I think this is close to the minimum price and does not include transportation charges. The mixture required is 100 pounds of crystallized chlorate of potash to 13 pounds of the best quality of manganese dioxide.

The cost of the chemicals per cubic foot of oxygen at the above rate would be about 2.25 cents. The manufacturing charges would, of course, have to be added to this, and they depend considerably upon the methods used in figuring by those in charge of the cost system.

Test of Oxygen

The purity of the oxygen used has a great deal to do with the strength of the weld produced. It is, therefore, very essential that oxygen with the least impurity should be used. The oxygen that can be obtained at the present time varies from 80 per cent to 99 per cent pure, the latter purity being obtained by an electrolytic process. The oxygen produced by the first of the plants we will describe later, running it close with 97 per cent purity. The apparatus, Fig. 2, used to test the purity of oxygen consists of a burette, or gas meter A of 100 cubic centimeter capacity, a glass tube B running from the top and having a three-way cock C at the other end, there being an intervening branch with a stop cock D connected to a glass receptacle filled with short lengths of glass tubing to prevent bubbles in the contained liquid. The upper end of this receptacle has a clearly distinguished mark F located immediately below the stop cock. The bottom end of this glass receptacle is connected by a U tube to the bottom of a similar vessel G, to whose upper end is connected a rubber bulb H. The two glass receptacles are half filled with a mixture as follows, which we will call the absorption liquid, the two solutions not being mixed until they are poured into the glass receptacle as they would absorb oxygen from the air:

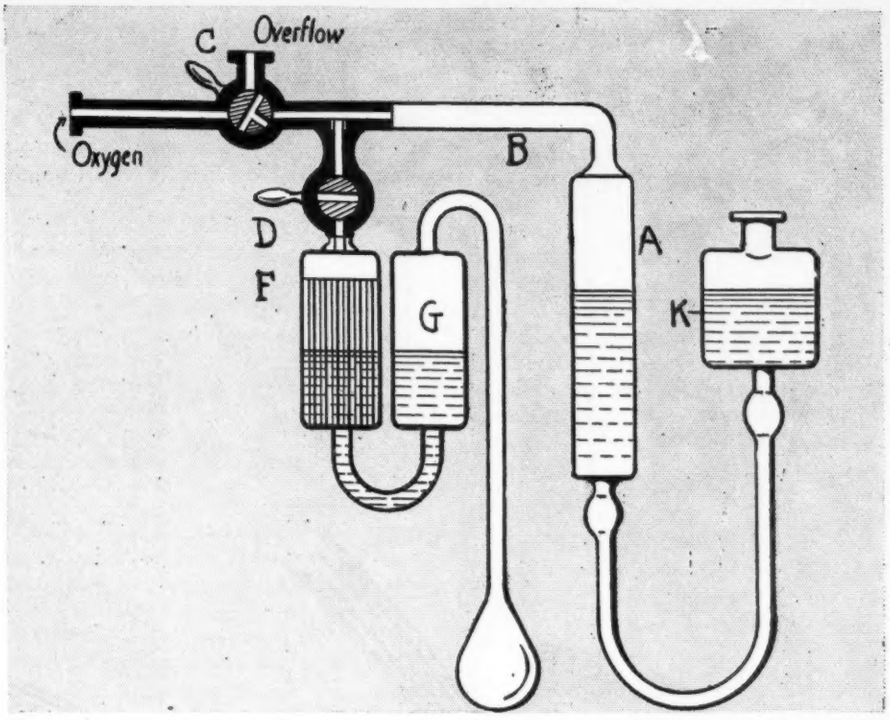


FIG. 2—APPARATUS TO TEST PURITY OF OXYGEN

One ounce pyrogallic acid to 150 cubic centimeters water.

Forty-eight grams caustic soda, sodium hydrate purif., to 50 cubic centimeters water.

A rubber hose connects the bottom of the burette with the bottom of a vessel K containing water. Gas contained in the burette is displaced by raising this vessel, allowing the water to flow into the burette.

The test is made as follows: Air is dispelled from above the absorption liquid contained in E and G by pressing the bulb B with the stop-cock D open, closing it again when the liquid reaches the mark F. Air is then dispelled from the burette and glass tube by raising the bottle of water until the water flows out at one opening of the three-way cock C, the other end of the three-way cock then being opened to the source of oxygen supply. The water is thus lowered in the burette until a given quantity of oxygen is drawn in, as shown by the relation of the surface of the water to the graduations, allowance being made for the volume of the tube B. The water is then raised and the stop-cock D opened, the oxygen being forced into the receptacle containing the absorption liquid, care being taken to close the cock before the water enters. After a time the stop-cock is opened and the oxygen allowed to pass back into the burette, the stop-cock being closed when the absorption liquid reaches the mark F. The water bottle is held so that the surfaces of the water are level, thus not applying any pressure to the oxygen. The relation of the surface of the water to the graduations is then noted. The difference between this reading and the one first taken being the amount of oxygen absorbed. This is repeated until two readings come alike, which shows that all the oxygen has been absorbed by the liquid, the gas remaining in the burette is the impurity, and the percentage can be determined readily. The absorption liquid is good for a hundred or more tests.

Chemical Generation of Oxygen

The process of generating oxygen as carried out with the Davis-Bournonville apparatus consists of filling pressed steel retorts with a mixture of chlorate of potash and manganese dioxide, then driving off the oxygen by heat applied externally by a gas burner. The oxygen bubbles up through three washers containing a solution of caustic soda, thence passing into the copper gas holder from which it is pumped by the two-stage compressor into cylinders at a pressure of 300 pounds per square inch, the object in compressing it as high as this being to obtain sufficient pressure for cutting thick steel with an oxygen jet, and also to reduce the dimensions of the cylinders to a practical size.

High-Pressure Generation of Oxygen

This process also generates oxygen from the above chemicals, the pressure being produced by the generation of the gas. This somewhat simplifies the plant, but is attended with certain disadvantages. A large

amount of oxygen is lost due to it being under pressure when the retorts are open for the refilling, and also from the washers, if they are of adequate size. Owing to the retorts having to stand considerable pressure, they are much heavier and require considerable more heat or longer time to generate the gas, and there is much more chance for leakage. The covers also have to be much more securely fastened, and therefore take longer to adjust. Possibly the greatest disadvantage is the fact that, owing to the bubbles of oxygen passing through the washer under considerable pressure, they are very small and do not offer much surface to the liquid. The washer would, therefore, have to be many times the capacity to give equal purity of the oxygen with the low-pressure type. The maximum pressure at which it would be practical to generate oxygen in this manner would not be sufficient to cut thick steel, and the cylinders would either be of small capacity or be of an unwieldy size.

Generation Without Compressor

There is a process in which a mixture is made of the above chemicals, together with a certain proportion of carbon, lamp black being used. The carbon is ignited by means of an ignition powder and the retort is then closed, combustion continuing due to the supply of oxygen generated. This process has all the disadvantages attending the last process described, together with the additional one of consuming a considerable proportion, estimated at 12 per cent, of the oxygen produced, in generating its own heat. The internal combustion also supplies other impurities which ought to be removed from the oxygen.

Dangers Attending the Process

A report has been circulated that there is considerable danger attending the use of high-pressure oxygen in cylinders, but this is not the case, as is shown by the fact that the railroad companies accept compressed oxygen in cylinders at less than second-class rates for transportation anywhere, and are daily handling large numbers of them. This report was based on a recent accident at a plant of this nature, but investigation proved that the accident was entirely due to the failure of the compressor used to pump the oxygen into the cylinders and not the oxygen.

It is, however, very essential that carbon in any form should be entirely eliminated in the manufacture, storage, and use of oxygen. Oil should not be used on compressor valves, gauges or any other part; even spindle and rod packing material should be free from hydro-carbons. The manganese dioxide used in generating the gas should be free from carbon; therefore only the best should be used. These points do not, however, cause any trouble when the fact is understood.

Diameter Inches	Length Inches	Capacity Cu. Ft.	Weight Pounds
7	24	50	50
8	30	80	75
10	30	125	105
12	36	225	120
14	48	400	349
16	48	500	435

All cylinders are charged at 150 pounds pressure

TABLE 1

Cost of Autogenous Welding

The cost of operating the oxy-acetylene torch as compared with the oxy-hydrogen and oxy-coal gas is clearly shown in Table 2, which is deducted from figures given in the Bulletin Technologique of September, 1907, the calculations being based on generator acetylene at 1 cent per cubic foot. Compressed acetylene at 2½ cents per cubic foot, oxygen at 3 cents and hydrogen at 1 cent, the coal gas being figured at $1.25 per thousand cubic feet. As these figures were based on the use of the high or medium pressure torch, figures are appended which give the corresponding values for the low-pressure torch. Table 3 gives the cost of welding sheet and plate steel with the high-pressure torch, and includes the operator's wages, which is figured at 30 cents per hour. This table is based on straightforward work, short jobs costing more, due to the time taken to give the initial heat.

High-Pressure Air-Gas Torches

Coal gas flames give a temperature only slightly higher than the point of fusion of most metal, but owing to the conductivity of the metal the heat is carried away as rapidly as it is supplied by the low-temperature flame, and unless the part is small the heat continues to be absorbed by the metal until the radiation from the surface of the heated portion is sufficient to balance the heating effect of the flame; the metal at no point exceeding a certain temperature which is a balance between the temperature of the flame and the rate of conductivity and radiation of the metal. Under certain conditions cast iron can be brought to a plastic state, in which condition it can be rubbed together, but that can scarcely be termed welding, though it answers for some purposes.

Strength of the Weld

A good deal of comment has been made as to the small amount of knowledge we have regarding the strength of oxy-acetylene welds under the vibration test. One might also suggest that though electric welding is extensively used on certain parts of motor cars, some of which are of vital importance, very little is known of the strength under these tests; but apart from that, not one-tenth part of the welds that would be carried out with this process in a motor car plant would come under these considerations at all; for instance, cracks in new frame members are invariably lengthways of the metal and do not materially affect the strength of the part, only requiring welding from a point of view of policy, and these can be welded cheaper than they can be returned to the maker. How often squares on the ends of shafts will come a few thousandths of an inch small, and how much better it is to weld metal on and remill them than to electroplate them, as I have known to be done.

If a frame cracks or breaks in use it is necessarily a repair job, and there is no need to try and entirely hide the defect, and therefore there is no objection to building up metal on the inside to any amount, so as to entirely eliminate any possibility of future breakage at that point. Useless holes in frames, due to change in design or errors, can be welded up solid and are far better than the usual plug which does not add to the strength and eventually shows through the paint. Inlet and exhaust manifolds and water pipes can be far better welded up out of tubing than either cast or brazed up, and there is a very large sphere of usefulness for this process in places where extreme strength is of no importance, though this can be obtained in most cases except where certain special metals are used.

Points to Observe in Welding Steel

Steel does not become so fluid as the majority of metals, and can, therefore, be worked in any position. It is possible to weld on the under side, particularly where the high-pressure torch is used, as the high pressure spreads the metal, thus making it possible to weld a motor car frame in place and even add metal to the under side of the upper flange, or to the lower side of the bottom flange as well as to the vertical web. When adding metal care should be taken not to let the full force of the flame play on the rod, unless it is in contact with the larger body of metal being welded, which will absorb the surplus heat and prevent it being burned.

As in blacksmiths' welding, the amount of carbon has a good deal to do with the strength of the resulting weld, high carbon steel not always proving satisfactory, though high speed steel can be welded to machine steel without any trouble, and this feature should prove interesting to superin-

Tip No.	Thickness of metal	Consumption of acetylene per hour	Consumption of oxygen per hour	Linear feet welded per hour	Cost of labor per hour	Total cost per hour	Cost per linear foot
1	1/32 to 1/16	2.8 feet	3.6 feet	50 feet	30 cents	0.43	$0.008
2	1/16 to 3/32	4.5 feet	5.7 feet	30 feet	30 cents	0.51	0.017
3	3/32 to 1/8	7.5 feet	9.7 feet	25 feet	30 cents	0.66	0.026
4	1/8 to 3/16	11.7 feet	15.0 feet	16 feet	30 cents	0.86	0.054
5	3/16 to 1/4	18.0 feet	23.0 feet	10 feet	30 cents	1.17	0.117
6	1/4 to 1/2	25.0 feet	32.0 feet	7 feet	30 cents	1.51	0.216
7	1/2 to 1/2	32.5 feet	41.5 feet	5 feet	30 cents	1.87	0.374
8	1/2 upward	48.5 feet	62.0 feet	.....	.....	2.64	.....

Oxygen at 3 cents; acetylene at 1 cent per cubic foot; labor at 30 cents per hour

TABLE 3—APPROXIMATE COST OF OXY-ACETYLENE WELDING

tendents, as considerable reduction in the amount of this expensive commodity required should result by its use. Broken crankshafts have occasionally been welded, though I do not recommend this unless it is in the web where a large amount of metal can be added, or at the end of a bearing where it can be left large and the bearing correspondingly shortened. This, however, being only advisable in cases where it is difficult to get a replacement.

Welds in Cast Iron

Cast iron is really the most satisfactory of all metals for welding, as it becomes sufficiently fluid to leave a smooth surface. In a molten state the metal flows very much like mercury; that is, it hangs together in balls. These balls have to be broken up by what is termed scaling powder, which is used in much the same manner as a flux in brazing. Salt can be used for this purpose, though it is liable to harden the metal. The Davis-Bournonville company has a powder the use of which is not attended with this disadvantage, the composition being somewhat of a trade secret, though the price at which it sells is so low as to make it not worth while trying to imitate it. Considerable care has to be exercised as to the nature of the filling stick used, as iron containing scrap will often cause trouble by hardening. It is, however, no trouble to obtain soft welds when care is taken in selecting this material. Care should also be taken not to overheat the metal and also to allow it to cool off slowly.

Intricate castings should be preheated all over to several hundred degrees, though not enough to cause serious warping, to reduce the possibility of shrinkage cracks, which will, otherwise, sometimes take place due to the extreme difference in temperature at different parts of the casting. Foreign motor car cylinder castings are particularly liable to this, possibly owing to the large percentage of sulphur producing hot shortness. Cast iron has the peculiarity of flowing to the part having the highest temperature; it is therefore necessary when wishing to draw metal from one part to another to play the torch on the latter place, but, of course, keeping the other one molten.

The operator is aware of the blow holes he leaves in the weld, as the metal will not flow over these without special effort on his part, the hole showing as a depression in the surface which must be blown open with the flame so as to close from the bottom, or, as is often the case, when it is due to sand or slag it must be dug out with an iron rod in order to be eliminated. The special effort required to close over this depression and thus produce a blow hole consists of playing the torch in a circle around the depression and then suddenly removing it, the momentum of the metal causing to unite over the cavity. The desirability of doing this is, of course, determined by the requirements of the piece being welded.

Possibly the most radical development which this process has produced is the satisfactory welding of aluminum, which has so long defied all attempts to unite it in a manner that would withstand a strain anything like the metal itself. This is due to the reducing nature of the flame, though this is not sufficient to cause the metal to flow together, the actual uniting being produced by puddling the molten metal with a steel rod, which effectually breaks up any coating of oxide. In the same manner bosses and other additions can be added to castings, being shaped up in much the same manner as one might do with the moulding sand. The molten metal working in much the same manner as this sand.

Great care has to be taken in handling this metal, owing to it having very little strength when heated a few hundred degrees, and this difficulty is increased by its high heat conductivity, which allows very little difference in temperature between the place being welded and the surrounding metal. This is, however, taken care of by supporting the metal on the other side with graphite blocks.

When casting any metal which is not ductile, there is more or less trouble with shrinkage cracks, and of course this is also the case with welding. Though shrinkage cracks can be welded up, in some cases they are produced by welding, as can be realized when it is considered that very often the metal is already taxed to the limit by the internal strains, and the extra strain, produced by heating, or else the weakening of the metal by its application, proves to be the last straw. This can be well understood by those who have had experience in soldering aluminum, as the small heat required for the purpose is sometimes sufficient to produce a crack. This is obviated to a great extent by heating the whole casting uniformly, thus reducing the difference of temperature between the part being welded and the body of the metal. However, by far the majority of breakages consist of lugs and arms broken off entirely, and there is seldom trouble of the above nature in their repair.

Brass, Malleable Iron and Steel Castings

Brass is more difficult to work than most metals, and requires more experience on account of the zinc readily burning out and depositing a yellow powder on the weld, and also leaving blow holes; it is advisable to use borax to prevent this deposit. It is necessary to get the metal to a good red heat and then quickly bring the welding flame down on it, as quickly removing it as each drop flows. Care should be taken not to breathe much of the fumes from the zinc.

Malleable iron is a very unsatisfactory material to weld, owing to its variation between what is practically cast iron and what is practically steel and, on thick castings, often a combination of both. In most cases, cast iron can be used as a filler, but, of course, this is not always advisable owing to its unsuitability to withstand shock. Steel can, of course, be used, but does not work so well, except with the kind of malleable iron that is practically steel. The motor car manufacturer would, however, mainly use the torch on this material to fill blow holes, weld up shrinkage cracks and to add metal to replace errors in workmanship, and in most cases cast iron would be satisfactory for these.

There is an enormous benefit to be derived from the use of this process to eliminate defects which seem bound to appear in steel castings, the use of which is a very important consideration, at any rate in motor car truck manufacture. The success with which steel castings can be welded depends largely on the nature of the metal, and this would, of course, determine the extent to which it could be used. Commercial soft steel wire is used as a filler in most cases, but sometimes it is desirable to use pieces from a similar casting, and these can readily be cut into strips by the oxygen cutting torch. It is advisable, where possible, to test sample welds where the best combination is not known.

With this process it is possible to unite different metals. Those having the nearest fusion temperature of course being most practical. So far, there is very little use for such combinations. The most useful combination, however, is copper and steel, these metals mixing in such a manner that it is impossible to say where one commences and the other ends. This is of great advantage for electric conductors, as there is no possibility of oxidation taking place between them and reducing their conductivity. This has been taken advantage of by the Davis-Bournonville company in its patent electric rail bond.

	Oxy-acetylene mixture	Oxy hydrogen mixture	Oxy-coal gas mixture
Number of B. T. U. obtained by complete combustion of 1 cubic foot of gas	1.570	290	616
Temperature—Fahr—obtained by complete combustion of the mixture about	6,350°	4,000°	3,150°
Cubic feet of oxygen required to burn 1 cubic foot of gas to obtain the best welding flame from practical tests made	1.30* 1.70†	0.25	0.67
Cubic feet of oxygen required to obtain 100 B. T. U. with a welding flame	765* 1.00†	0.86	1.09
Cubic feet of heat producing gas required to obtain 1000 B. T. U. with a welding flame	0.59	3.44	1.63
Cost of 1000 B. T. U., cents	2.89* 359† (Gen. Acct.) 378* 4.30† (Dis. Act.)	5.92	4.26

* Medium pressure torch used. † Low pressu.e torch used.

TABLE 2—COST OF OPERATING OXY-ACETYLENE TORCH COMPARED WITH OTHERS

From the Four Winds

TESTING PACKARD AS HILL-CLIMBER ON RIFLE RANGE NEAR DETROIT

More Legislation—Assemblyman Marks has introduced at Albany, N. Y., a bill making it a felony for a motorist to wilfully abandon a person whom he has killed or injured accidentally. The punishment is 2 years' imprisonment or a fine of $1,000.

Binghamton After City Car—Mayor Slauson, of Binghamton, N. Y., in his recent annual message, has recommended that the police department of that city buy a motor car for emergency calls, to be used instead of the present patrol wagon.

Buffalo's Show Plans—Elaborate electrical decorations will be a feature of the motor car show to be held at Convention hall, Rochester, on March 2-6 by the Automobile and Motor Trades Association of that city. The ground floor of the hall will be so transformed as to resemble city streets. A background of scenery representing motor cars filled with merry crowds will be an attractive feature. Music will be furnished by five different bands and orchestras.

Another Governor Enthusiast—Good roads enthusiasm still continues to grow in the east. Following the lead of Governors Hughes, Stuart and Fort, of New York, Pennsylvania and New Jersey respectively, the new chief executive of Delaware, Simeon S. Pennewill, in his inaugural came out with a strong recommendation of the movement. "Permanent improvement of our public roads," said his excellency, "would immediately increase the value of our farms to an amount almost equal to the cost of such improvement; and if that be true, neither the present nor future generations should complain of the increased burden. Proper legislation along this line is a direct and general benefit particularly to the farmers."

Club in Parsons, Kan.—A club has been organized at Parsons, Kan., with fifty members, the Parsons Automobile Club. The officers elected are as follows: J. C. Olson, president; P. R. Kimball, vice president; Charles E. Steele, secretary; E. F. Delay, treasurer.

Nadall Rim Wins—At a social session of the Minneapolis Automobile Club, recently held at the Plaza hotel, over 200 of the members enjoyed an exhibition of changing demountable rims, the representatives of local concerns doing the work. Three rims were represented—the Diamond, Nadall and Fisk—and, after explaining the workings of the various types, a contest on the speed of making a complete change was made. In this contest the Nadall rim won out, the complete change being made in 30 seconds.

For Ocean Boulevard—An enthusiastic meeting in the interests of the proposed Ocean boulevard in New Jersey was held at Cape May. Senators, assemblymen and the mayors of many of the towns along the proposed route were present. It was pointed out that the erection of five bridges and the building of 14 miles of road would complete the boulevard for the entire length of 127 miles from Sandy Hook to Cape May, and that the increased registration fees resulting from the new road, together with the increase in the taxables, would more than pay the expense to the state. A resolution was adopted recommending that, if both road and bridges cannot be built at once, the bridges be erected first in order to make the road continuous.

Absent-Minded Owner—Over 2 years ago a man ran a flat-tired 1902 Autocar into Whitaker Brothers' repair shop, at 536 Diamond street, Philadelphia, and, giving orders that the necessary repairs be made at once, and that he would return within an hour, he hurried away. Perhaps he was absent-minded; possibly he was tired of motoring; mayhap he forgot where he left his car—at any rate he never came back, and now the Whitakers are advertising in the public prints of the Quaker City that if the owner doesn't appear and pony up for the repairs the car will be sold to pay the expenses.

Still After Boulevard—The plan to build a boulevard connecting Buffalo and Niagara Falls is still being agitated by motorists and others. An aldermanic committee is likely to be appointed to confer with Buffalo motor car owners for the purpose of carrying the project into effect. Supervisor Hollister, of Tonawanda, N. Y., has introduced a resolution in the Buffalo board of supervisors which would permit the state to construct connecting roads through third class cities. This would make it possible to have a section of the Niagara river road improved with state aid. These proposed improvements would be in line with the plan to construct the boulevard.

Crisis in Aluminum Industry—Some of the European trade journals have been discussing the present state of the aluminum industry. A German technical monthly says the overproduction of the metal is such that a cut in the already fairly low price as compared with the price 2 years ago is imminent. At the present time it is estimated by the German publication that the world's production of aluminum amounts to very near 37,000 tons and that the cost of production of $35 to $37.50 per 100 kilos, or 220 pounds, on record at the end of 1908 will drop from $10 to $20 within a few months. In 1906 the cost of production per 100 kilos ranged from $112 to $125. One of the reasons of the drop in price is the crisis which upset the motor car industry in Europe last year. Another reason is the smaller demand made by steel plants for aluminum, as they use a substitute called ferrosilicium, which, although costing more, is found to be of better service than aluminum, it is said. In 1905, it is

further recorded, the production of aluminum amounted to 11,500 tons for the world, and of this amount the United States contributed 4,500 tons and France 3,000.

Another State Road—The board of supervisors of Orleans county, New York, has passed resolutions in favor of the construction of a new state road running through Barre, Shelby and Clarendon, New York. This route when completed will be used extensively by motorists.

Another Packard Stunt—From Detroit to New York in 4 days was a recent mid-winter feat of a Packard Thirty car, driven by S. D. Waldon, general manager of the Packard Motor Car Co. The car was driven down through Ohio to Pittsburg, and thence to Philadelphia over the Allegheny mountain route, which has been the scene of so many summer record-breaking trips by Mr. Waldon.

Owner Waxes Enthusiastic—Owners frequently grow enthusiastic in the praise of their favorite cars and some go so far as to coin new phrases descriptive of them. It remained for a California owner, however, in describing his car, to go a step farther than even the most warm-blooded partisan had ever gone before. He said: "The car that can race a railroad train, the car that will make a steep hill ashamed of itself, a faithful, sweet-running car that purrs like a kitten. To own such a car is to possess a kingdom. The driver's seat is a throne, the steering wheel a sceptre. Miles are your minions and distance your slave."

Hovers to Try Again—Mr. and Mrs. H. A. Hover, of Spokane, Wash., who recently completed the first lap of their trip around the world in a Maxwell touring car by arriving at New York, set sail for Algiers on January 22 on the ill-fated steamship Republic. As is well known, the steamer was run down in a fog off Nantucket by the steamer Florida of the Italian line and all passengers were transferred to the other boat. The Florida having suffered from the collision also, however, the passengers of the Republic, together with those of the Florida, were put on board the steamship Baltic, which carried them back to New York 2 days after they had set sail. The experience was harrowing and Mr. and Mrs. Hover lost everything they had on board with them. They arrived at their hotel in New York absolutely exhausted and with only the clothes on their backs. Their car fortunately was sent to Algiers on another vessel and is now well on its way across the Atlantic. The plans of the tourists were naturally unsettled by the accident, but after they have equipped themselves again for the journey they will again cross the ocean later in the winter and continue their trip around the world. Their journey of 100,000 miles will be the most comprehensive ever undertaken by motorists. They will journey through every country of northern Africa, Europe and Asia, and expect to return home in the spring of 1914. They will go prepared to spend their nights by the roadside and will carry a camping outfit for this purpose and a full set of arms for self-defense.

American Show Dates

Chicago	February 6-13
Denver	February 16-18
Detroit	February 15-20
St. Louis	February 15-20
Toronto	February 18-25
Hartford	February 20-27
Cleveland	February 22-27
Baltimore	February 24-27
Omaha	February 24-28
Buffalo	March 2-6
Kansas City	March 8-13
Milwaukee	March 11-14
Portland, Ore	March 8-18
Minneapolis	March 13-20
Rochester	March 15-20
Pittsburg	March 27-April 3
Louisville	April 15-17

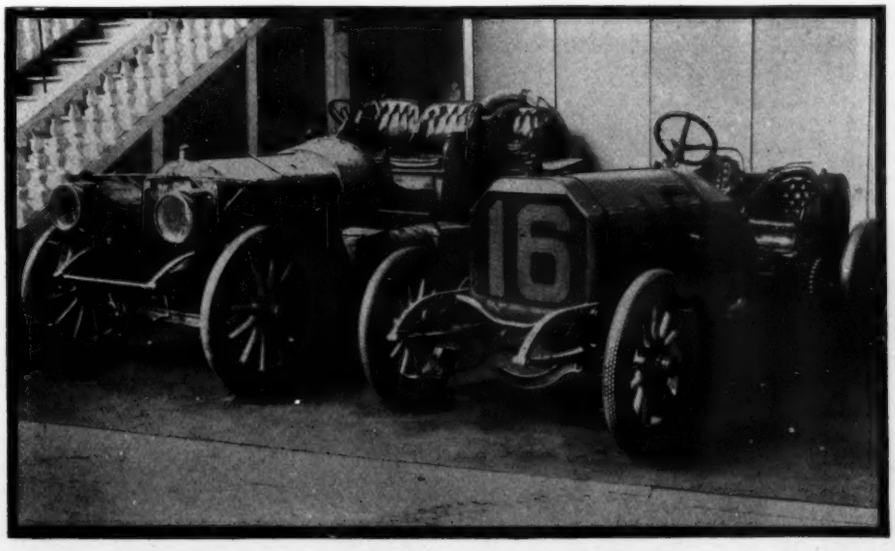
Little Rock Organizes—The good roads movement will have another stanch supporter in the Automobile Club of Little Rock, which reorganized at a meeting in the board of trade rooms at Little Rock, Ark. About thirty members were present at the reorganization. Officers for the ensuing year were elected as follows: C. A. Pratt, president; W. L. Hemingway, first vice-president; Harry Lasker, second vice-president; H. J. Blakeslees, secretary; C. K. Lincoln, treasurer; W. L. Tedford, E. P. Ladd, Irving Hirsch, D. H. Cantrell and W. B. Miller, board of governors.

New Orleans Meet—The New Orleans Automobile Club is making great plans for its track meet February 20, 21 and 22. Special speed racing will be a prominent feature. Fred J. Wagner has just secured de Palma with the Fiat Cyclone to race against Strang in an Isotta; Denison in the Knox Vanderbilt cup racer; Schoeneck in a Renault, and Burman in a Buick. In the 24-hour race Wagner has secured Strang in an Isotta; de Palma in a Fiat; a Renault team, with six men; a Knox, and probably the Lozier. There also are entries from the Buick; the S. P. O., with Anderson driving, and two local cars, while it is said Thomas will send Salzman with a six. The National and Jackson have promised entries.

Johnson Cup Run Planned—The Binghamton Automobile Club, of Binghamton, N. Y., has arranged for the 1909 Johnson cup contest. The route next summer will be between Binghamton and Boston, and the contest will be held under the rules used in the last Glidden tour. The run will begin on June 14. This will be the fourth annual contest held by the club.

Hill-Climbing Tests—Winter testing forms a large and important part of the experimental work of the Packard Motor Car Co. The several experimental cars manufactured each season are driven many thousands of miles in hard overland trips by the executives of the company as well as by Chief Engineer Huff and others. When M. J. Budlong, president of the Packard Motor Car Co., New York, was at the Packard factory he, in company with President H. B. Joy and General Manager S. D. Waldon, devoted considerable time to hill-climbing experiments on the steepest snow-covered grades in the vicinity of Detroit.

Franklin's Reliability Record—The covering of 5,000 miles with a perfect score is the record made by 1909 models of the Franklin motor car during the year just ended. This is the equivalent of a run from the Atlantic to the Pacific and back as far as Kansas, the termini of the course being New York and San Francisco, without, it is claimed, the adjustment of even a nut or a bolt being made and without breakage or trouble of any sort. The 5,000 miles which the Franklin covered in competition without penalization in any form were in five contests. These were the Glidden tour, the Bretton Woods run, the Cleveland reliability contest, the Chicago endurance run and the Worcester endurance and reliability competition.



FAMOUS CARS FOR CHICAGO SHOW—NEW YORK-PARIS THOMAS AND VANDERBILT LOCOMOBILE

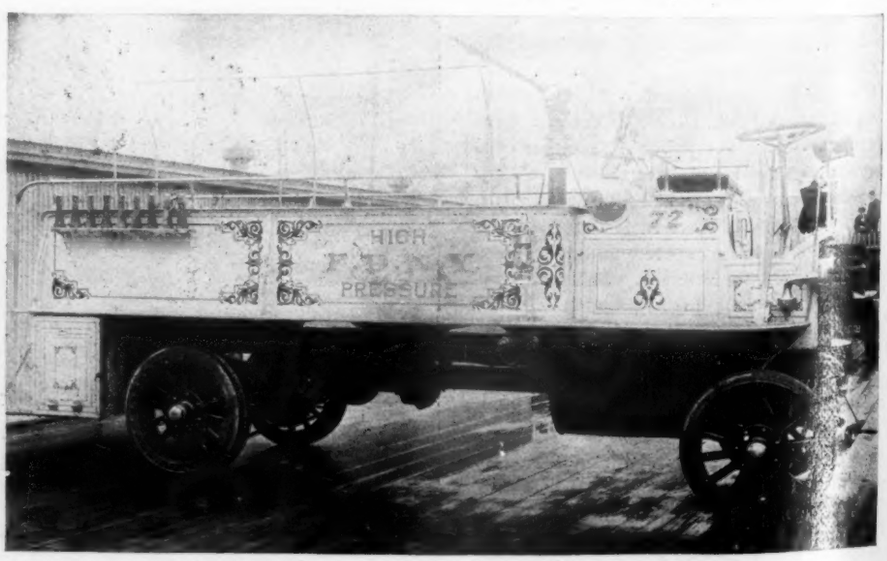
Realm of the Commercial Car

KNOX TRUCK EQUIPPED WITH FIRE-FIGHTING APPARATUS

THE demand for motor vehicles for fire department work is becoming greater each succeeding season, and although many eastern cities are adopting fire-fighting motor vehicles the great advantage of such machines has not as yet dawned upon hundreds of the fire departments throughout the country. The Knox company has been a leader in this respect in America, having been bringinig out special fire department wagons of one nature or another for several years. The latest development by this concern is an immense hose wagon built expressly for the New York fire department, and delivered to the department since the recent Madison Square garden show, where the leviathan was on exhibition. The truck is capable of carrying an immense length of hose, and has mounted in it a large universal nozzle placed back of the seat and shown in action in one of the illustrations when it was being officially tested by Chief Croker of the fire department. The test was specially made to see if the general construction was suitable for high pressure work. In order to accommodate great lengths of hose the body part of the truck is divided by two longitudinal partitions in three equal-sized compartments, into which the hose is regularly folded. The truck carries the usual rear step. The power plant is one of the Knox water-cooled four-cylinder motors, with transmission through a selective gearset and side chain drive. Use is made of the latest adoption of the Knox company, the three-disk clutch in the flywheel. The truck is fitted with dual rear solid rubber tires, and a full quota of fire department accessories makes the transformation from a big industrial truck to a full-fledged fire department wagon complete.

POWER WAGONS FOR MANY USES

Manager W. B. Kennedy, of the commercial vehicle department of the Studebaker company, calls particular attention to the wide variety of uses to which commercial trucks and wagons have been put during the past year. Among the novel vehicles especially designed is a 10,000-pound United States naval gun factory truck, which is used in hauling heavy material around the arsenal yard. This truck has been in use several months, and reports show that it is working splendidly and is highly endorsed by the military authorities. In Pittsburg the Westinghouse company uses the Studebaker ambulance constructed on a 1,500-pound chassis. The vehicle is equipped with platform springs in the rear, and is said to be one of the most easy riding ambulances ever constructed. It has greater speed, of course, than any horse-drawn vehicle and naturally reaches the destination of its call with greater rapidity. It is comfortably fitted with a stretcher and other paraphernalia, and has been highly endorsed by surgeons and nurses who have given this considerable use. Another vehicle which is highly commended is a bank wagon sold to the National Bank of Commerce at St. Louis. This vehicle is divided into three compartments, namely, the driver's compartment, a center compartment for the carrying of funds, and a rear compartment for passengers. The officials of the bank use the car to send visitors, directors and officials to another bank or to any point in the city. The middle compartment is fitted with steel boxes, in which currency may be carried. The wagon has ample over-load efficiency, and carrying a million dollars' worth of currency is one of its daily duties. Another vehicle which has created widespread attention is a twenty-passenger Studebaker motor omnibus recently delivered in Chicago. This vehicle is adapted to hotel use and is divided into three compartments. The first compartment is for the driver and is equipped with closed front and side curtains, offering protection in inclement weather. The second compartment is entirely closed, being built on the coupe order. This compartment has front and rear cross



KNOX HOSE WAGON BUILT FOR THE NEW YORK FIRE DEPARTMENT

Renewed Activity in Many Lines

seats and accommodates very easily six passengers. The convertible feature of this bus is embodied in the third compartment. This section is equipped with two seats—one on each side of the bus—running lengthwise, six people being accommodated on each side. In case of necessity the seats are removable, thus allowing ample space for freight and baggage. These are but few of the hundred different varieties of the utility of the vehicles placed with customers of the Studebaker concern during the past season, and it is believed the popularity of motor commercial vehicles is developing rapidly, requests coming in daily with specifications for anything from enormous trucks for the carrying of steel rails to light running parcel delivery wagons.

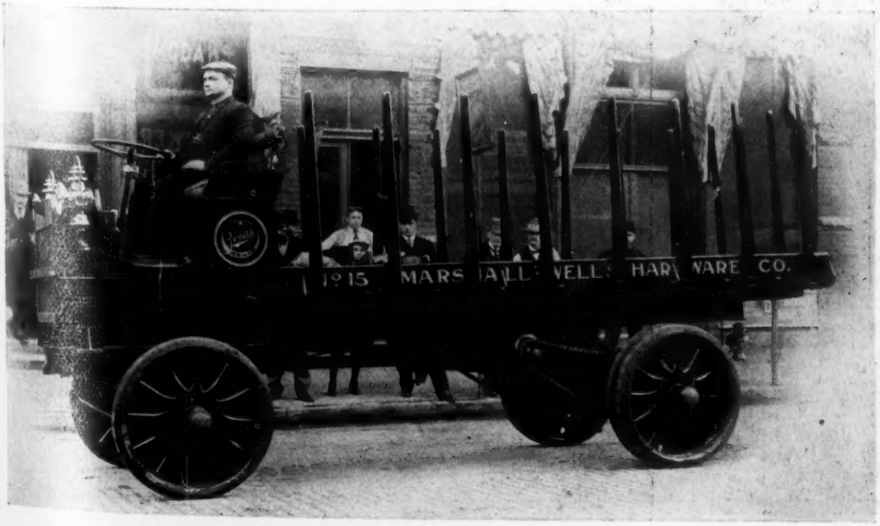
DEMONSTRATION OF UTILITY

What the motor car can do in the way of quick delivery of small commodities was given a demonstration recently at Grand Rapids, Mich., where one afternoon the Crosby Insurance Co. sought to place in the hands of its patrons a large number of calendars in a few hours. Two touring cars, not delivery cars, were pressed into service. One of them was a Franklin, and with this a large part of the work was done, 250 delivery stops being made in 5 hours. After twenty-five stops the other motor car experienced trouble and had to be sent back, the Franklin finishing the job.

COMMERCIAL ELECTRICS

The picture on the next page shows a part of the equipment of a large St. Louis brewing company that operates fifty-three electric trucks and delivery wagons, more than half of which are Waverleys. Of the fifty-three electrics, forty-eight are in daily service. Of this number the following is a month's record: Twenty-eight did not lose a minute's service for any reason whatever; sixteen missed 1 day each during the month on account of the drivers not being on duty; four lost from half to a full day on account of general repairs. In other words, the number of motor cars out of commission for the month on account of repairs was less than one-fourth of 1 per cent of the total in operation—and this is the record of a company that keeps its wagons constantly active. To keep all these electrics in operation requires only one machinist, one battery man, a boy, a foreman and two wagon washers. This small amount of labor for so much equipment goes to show that electrics are easily maintained.

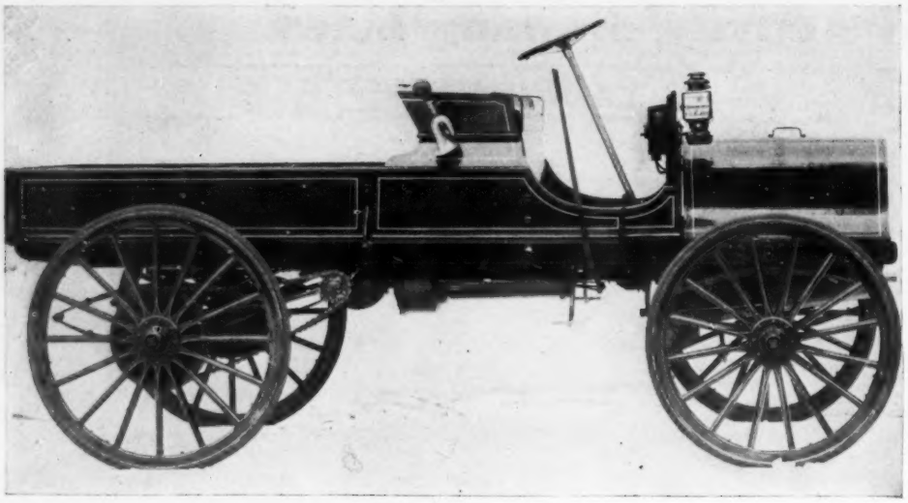
TEST OF KNOX HOSE WAGON BEING WATCHED BY CHIEF CROKER, OF NEW YORK



GRAMM-LOGAN 3-TON TRUCK IN USE IN THE NORTHWEST

CHASE TWO-CYCLE TRUCK

An interesting addition to the light commercial vehicle ranks is the three-cylinder two-cycle Chase motor buggy type of delivery wagon, suitable for 1,000 pounds loaded and capable of speeds from 10 to 20 miles per hour. The use of 37-inch front wheels and 40-inch rear places it in the motor-buggy ranks, and the employment of a three-cylinder air-cooled two-cycle motor gives a combination heretofore not met with in the commercial field, although a combination that has frequently been written about by makers of commercial cars who have simplicity as the keynote to be aimed at. The chassis illustrations show the general layout, with the vertical motor in front, with a peculiar peripheral suction blower flywheel and a propeller shaft connecting with the two-speed planetary gearset located in the center of the chassis and immediately in front of the jackshaft. From the jackshaft sprockets side chains transmit to the rear wheels. The motor with 3¾-inch bore and 4-inch stroke has no announced rating by its maker, the Chase Motor Truck Co., Syracuse, N. Y.. but is one of the very sim-



TWO-CYCLE CHASE MOTOR BUGGY TYPE DELIVERY WAGON

ple motor plants of the motor car field in that there are only two rotating shafts in connection with it, the crankshaft and a vertical shaft on the forward end on the top of which is the timer. The remainder of the motor comprises the cylinders and crankcase with intake and exhaust manifolds and carbureter, to which of course must be added the three pistons with their connecting rods. As in most two-cycle motors, the crankcase is divided into compartments, one for each cylinder. The carbureter is carried close to the intake manifold, which is a large pipe lying close to the cylinder bases and immediately above it is the exhaust manifold. The lubricating system is in conjunction with the carburation in that the oil in required quantities is mixed with the gasoline in the tank, and so long as the motor is running and consuming gasoline oil is being fed into the combustion chambers and crankcase with it. Cooling is accomplished by means of circumferential integral flanges on the cylinder walls and vertical radial flanges on the arched heads. A current of cool air is created by the suction flywheel blower, resembling in general layout the old-fashioned water wheel, in which the water shoots over the top, striking on the blades or vanes. The design of the blades is such as to pull the heated air away from around the cylinders. By this unique flywheel construction the maker of the Chase truck has obtained a cooling system without the use of an additional part in connection with the motor. The fan at the front end is eliminated. Little obstruction is offered to the support of the main frame of the chassis in that inverted T beam cross pieces are used, which span the frame width and support the crankcase beneath them. The general chassis parts back of the motor are few, comprising the two-speed planetary set supported between the differential housing and a cross piece of the frame. Brakes of the Raymond type operate on the rear wheels, elliptical springs are used in front and rear, and the frame is a wood construction reinforced along the inner sides of the side members with angle pieces to which attach the cross members and on which the motor is supported. The four wheel bearings are of the plain type, all of the motor bearings are bronze and the vehicle complete weighs 150 pounds. The regular body supplied is a democrat type with low sides. The wheelbase is 94 inches and tread standard.

BROOKLYN USES CARS

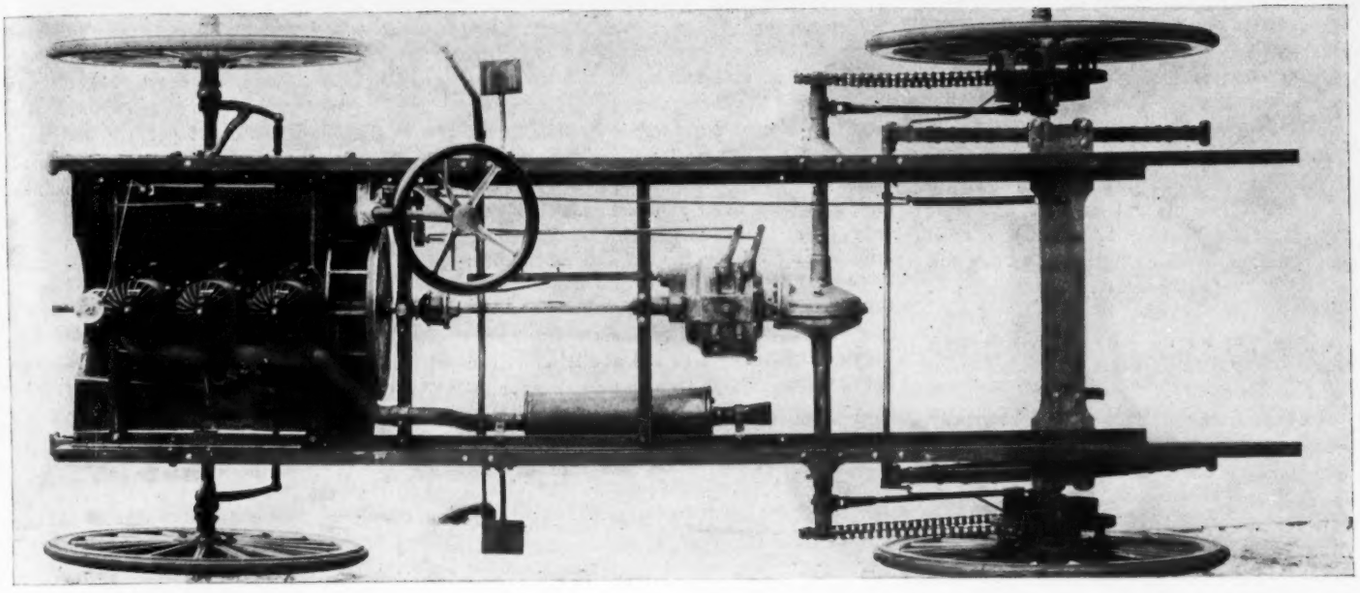
That the motor car has become a necessity in the expedient discharge of municipal affairs was perhaps never better demonstrated than it was during the last big snow storm in New York city. During the cleaning of the streets "Big Bill" Edwards, of the street cleaning department, and his assistant, Bill Hogan, were continually around in the two Lozier touring cars which this department has made use of continually for the last three administrations. This is not the only department the business of which is much facilitated by the use of motor cars, as Dr. Benzel, of the sanitary inspection service; Dr. Darlington, of the department of health, and Deputy Police Commissioner Baker, of Brooklyn, all use Lozier cars to aid them in the thorough discharge of their duties.

SUCCEED IN NORTHWEST

The Marshall Wells Hardware Co., northwestern distributer of the Gramm-Logan truck, has placed an order for five of the Bowling Green concern's 3-ton trucks and reports to the company that everyone of the big rigs shipped into that territory is giving great satisfaction. This 3-ton Gramm-Logan has a four-cylinder water-cooled motor of 45 horsepower, the cylinders being cast in pairs and with a bore and stroke of 4¾ by 5 inches. The valves are mechanically operated and the cooling system is operated by means of a gear-driven pump and fan. It has an enormous water capacity and its radiator is capable of holding 25 gallons, while 18 gallons of gasoline are accommodated in the fuel tank. Magneto and battery form the combination in the jump spark ignition outfit, while the oiler is self-contained in the motor and is gear-driven. The spark and throttle levers are on the steering column and the change-speed and emergency brake levers are at

SPRINKLING CART IN USE IN GERMAN CITIES

GARAGE OF ST. LOUIS BREWERY WHICH USES MOTOR TRUCKS



CHASSIS OF THE TWO-CYCLE CHASE MOTOR BUGGY TYPE OF DELIVERY WAGON

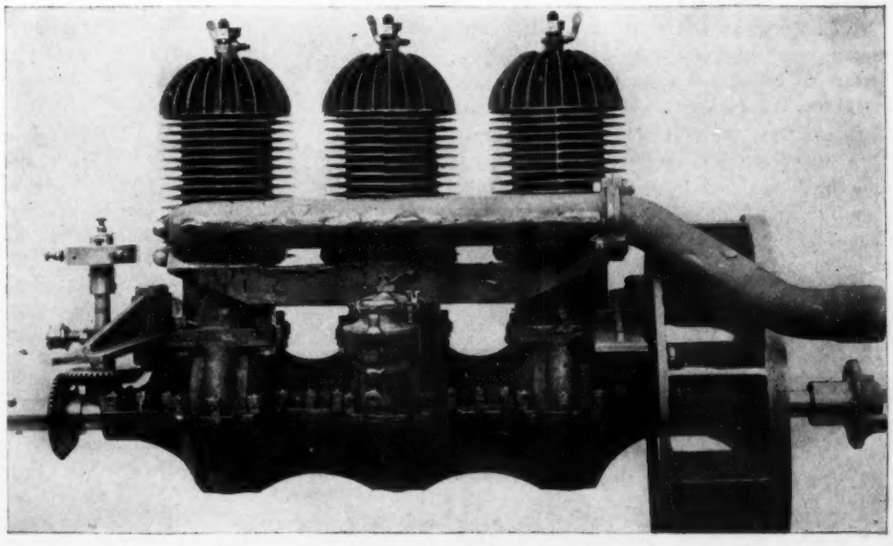
the side of the driver. The clutch and service brake are operated by means of foot pedals. The transmission is combined in one case with the jackshaft and there are three speeds forward. The drive is by means of a chrome nickel steel propeller shaft from the clutch to the transmission in direct line with the engine shaft and fitted with two universal joints and one slip joint. The final drive is from the jackshaft to the rear wheels by means of side chains. The gear ratio is nine to one on high. The wheels in front carry 36 by 5-inch solids, while on the rear are 36 by 3½ twins. The weight is about 5,000 pounds.

GERMAN STREET SPRINKLER

One of the most interesting and novel up-to-date municipal appliances recently placed in operation in Germany is the motor street sprinkler shown in an accompanying illustration. This modern appliance was constructed for the Städtische Strassenreinigung, Berlin, by the Neuen Automobil Gesellschaft. The tank holds 5,000 liters of water and just back of each rear wheel is a unique nozzle which sprays the water in a fan-shape spray the whole width of the street. For propelling the sprinkler a four-cylinder gasoline engine of 16 to 18 horsepower capacity is provided. There is a motor-driven pump provided of 3.5 horsepower capacity and each sprinkler has a maximum throw of 20 meters. The tank has sufficient capacity for sprinkling a distance of 1.5 kilometers, and it is stated that these sprinklers are not only utilized by the municipal authorities at Berlin, but also by those of Hamburg, Kiel and other German cities.

BUS WITH TEN TIRES

An omnibus mounted on pneumatic tires is the luxury that the General Omnibus Co., of Paris, is offering to its clients. In a little over a year's time the monopoly of the present company will expire, and if it is renewed it will only be on condition that all horse buses are abolished and a satisfactory type of mechanical vehicle substituted throughout the city. With a view to showing what it was capable of doing, the company commenced the gradual conversion of its vehicles about 3 years ago, certain lines being changed from horse to gasoline traction. But a perfect type of bus was not easy to find, and although the company has now nearly 200 buses, they are not all satisfactory. Motor traffic moves fast in Paris, the buses being no exception. The consequence is that the mechanism, mounted on solid rubber-tired wheels goes to pieces long before it ought to, the passengers suffer from excessive vibration, and the inhabitants of houses along the routes complain of the noise and shaking of their dwellings. After numerous tests, the company has now decided to adopt a new type of bus, and it is as the result of this decision that the public is now initiated to the luxury of pneumatic tires. The first of the new vehicles, a Renault of 20-30 horsepower, has just gone into service from Place Clichy to St. Germain des Pres, Paris, one of the most difficult routes in the city, for it comprises crowded streets, some steep grades, and rough pavement, all enemies of the motor bus. The new Renault, the first of a series of seventy-five similar vehicles, is mounted on Michelin triple and twin tires, the former being for the rear wheels and the latter for the steerers. This new type of rim and tire, which has been under test for the past 2 years, only made its appearance in public at the recent Paris salon, and is now being given its first real commercial test, the Renault being the first ordinary public service bus in the world to be mounted on pneumatic tires. All previous buses have been two-deckers with canopy top for the protection of outside passengers. The Renault is a single-decker having capacity for twenty-one passengers, nine of them having first-class seats in the forward part of the bus, six



VIEW OF ENGINE USED IN CHASE DELIVERY WAGON

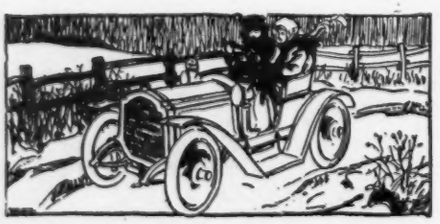
second-class seats, and six standing on the rear platform. The body is swung lower than on any previous type of bus, is wider, has a much more commodious platform, and is entered with greater ease. Artificial lighting is by powerful acteylene lamps. Big side windows in place of smaller ones on the older buses let in ample daylight, and heating is by means of a pan running the full length of the bus and receiving the hot gases from the exhaust. Normally the exhaust is discharged vertically at the top of the vehicle, but when required for heating can be turned into the foot pan.

A touring car chassis would naturally be impossible for a vehicle destined to take a charge of 3 tons; but though the Renault bus is a special construction, it embodies all the distinctive Renault features. Thus the frame is of very deep section pressed steel strongly bound by cross members and angle plates, and suspended on semi-elliptic springs both front and rear. The front wheels are wood artillery type with special double demountable rims; the rear wheels are of the steel plate type, each with demountable rims for three tires. There is a considerable rear overhang of the frame to give the necessary body space, the body itself, however, being kept within the axles.

The engine, unlike other Paris buses, is not under the driver's seat, but carried forward under a Renault type of bonnet, with a radiator on the dash, the water circulation through it being by thermo-syphon. The driver's seat is placed on the left-hand side, with brake and change-speed levers in the center of the space, this position, it is believed, being to the advantage of the driver for crowded city work. Another innovation for a city bus is the use of a self-starter of the compressed air type, worked off the timing gears, as on Renault touring cars. The control of the starter is at the left-hand side of the dashboard, and is provided with a special lead for taking off compressed air for the inflation of tires.

Even for such heavy work all Renault touring car characteristics are adhered to for transmission and final drive, the clutch being of the leather-faced inverted cone type, the gear set of the progressive type, with three speeds forward and reverse, and the final drive by propeller shaft and rear live axle. Naturally all the parts are adequately strengthened for the work they have to perform, and gear ratio is very much lower than on touring models.

It remains to be seen whether a bus of this type—perfect from the standpoint of the passenger, for it possesses speed, quietness and an entire absence of vibration—will be satisfactory to the operating company. It is declared that the ten pneumatic tires cost no more to maintain than the solid rubber and rubber block tires formerly employed. This, however, remains to be proved in practice. It is certain that there will be a considerable lengthening of the life of the mechanism as the result of the use of pneumatics, and this item will have to be taken into account when considering the smaller earnings of the bus due to the abolition of the upper deck. It has commonly been supposed that pneumatic tires were impossible for public service vehicles on account of their cost, but there was also another factor, namely, their inability to carry the loads put on commercial vehicles. If, as is claimed, the tire cost is not excessive, the introduction of twin and triple tires will cause a revolution in the motorbus world, for the public will not consent to ride on solids where pneumatics are available.



HOOSIERS BUY A RIG

A runabout will be purchased by the board of public school commissioners of Indianapolis for the use of the business director of the board. At the present time a horse and buggy is being used but owing to the large number of schools and the large territory to be covered, the director finds he cannot perform his work in a satisfactory manner. Bids will be received soon by John E. Cleland, business director.

A Sluggish Governor

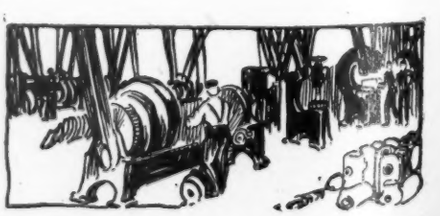
Some otherwise good engines govern poorly, not from any inherent fault of the governor itself, but because the throttle gives it too much work to do. The throttle, if of the butterfly valve type, may turn stiffly; or it may not be properly balanced, so that the suction tends to open or close it; or the throttle may be a horizontal shutter attached to a long sliding rod carried in several bearings. The weight of the throttle and rod, or a slight bend in the rod or imperfect alignment of the rod-bearings, may produce more friction than the force of a governor can quickly overcome. Thus, a governor which ought to be sensitive may allow the engine to fluctuate from a range of 25 to 50 per cent of speed when the clutch is engaged and released. If the trouble is due simply to the weight of the throttle, one or two tension springs attached to the rod and to a bracket above the rod, so as to take most of the weight of the throttle, will improve the governor action greatly. If the trouble is due to friction it becomes necessary to spring the rod or to re-line the bearings. Sometimes the throttle is hopelessly too heavy or stiff for the governor, and in that case nothing can be done, unless it be to cast the governor weights in lead instead of the usual bronze. If the engine is old it may be simply that the joints and bearings of the governor bell cranks and other mechanism have acquired so much play that they go through half their movement before taking up the slack. In that case the first thing to do is to fit new bushings and pins.

TRUCKS AS STRIKE-BREAKERS

Motor trucks were used quite effectively in breaking a brewery strike in Indianapolis, which has just ended. But for the use of gasoline cars the strike doubtless would be still on, whereas the men are now at work and the horse-drawn vehicles in use. Brewery workers struck for higher wages and the stable men and drivers in city delivery work struck through sympathy. The Indianapolis, American, Home and Tosseti brewing companies were all affected. The Indianapolis Brewing Co. already had one or two motor trucks, one of which had been used merely for hauling beer to and from the freight depots, and these trucks were placed in service. The Tosseti and and Home companies engaged trucks and drivers from the Indianapolis Motor Car Co. and these trucks were in service for more than 1 week. At the Home plant one truck accomplished the work formerly performed by four one-horse wagons, while one truck did all of the work usually performed by three wagons. Now that the strike is over the trucks are out of commission, but the brewers are said to be thinking seriously of displacing horse-drawn vehicles with gasoline trucks.

MILWAUKEE GETS CAR

The Milwaukee board of public works is to get the touring car for which it has been fighting ever since the city purchased cars for the fire chief, park superintendent, board of school directors, police patrol service and other purposes. The cost of the car is not to exceed $4,500. The proposition yet remains for the common council to confirm the action of its committee on public buildings and grounds. In view of the trouble that the police department is having in the matter of buying a car for the city detective service, the board of public works is not likely to have its car before summer. Injunctions have tied up the detective car purchase for more than a month. The injunctions apply directly to the board of public works, which issues calls for bids. The common council seems likely to be the next recipient of a motor car, as the need of such vehicles for the use of the many committees is strongly apparent.



Brief Notes from the Commercial World

Taxicab for Worcester—John S. Harrington, of Worcester, Mass., already heavily engaged in the motor car business in Providence, R. I., and also in Worcester and will have a line running about February 10. The Providence venture has proved a great success. The livery men cannot see the taxicabs making money in Worcester, but Harrington can, basing his belief upon the city of Syracuse, N. Y., smaller than Worcester, where they are being operated at a handsome profit, he has been told.

Florists Use a Rapid—Bertermann Brothers, of Indianapolis, have purchased a Rapid gasoline delivery wagon, being the first firm of florists in Indiana to adopt the motor car for delivery purposes. The vehicle is painted white, with the lettering in gold, making a very attractive appearance. On the front of the car is painted a wreath of roses in natural colors. T. F. Gibson, a retail meat dealer of the same city, has also just purchased a motor delivery wagon.

Delivery Power Wagons—Several weeks ago the Grabowsky Power Wagon Co. entered the field in Detroit with a new motor delivery car and a new idea in placing it before merchants by guaranteeing to maintain it at a nominal charge, relieving the purchaser of all responsibility in the matter. The first Detroit merchants to accept this proposition was the grocery firm of Peter Smith & Sons, who are not wholly unacquainted with the use of power wagons for delivery purposes, having tried out in a very thorough manner delivery of groceries by motor car under the old methods, the verdict being in favor of the motor.

Tea Concern Converted—The Great Atlantic and Pacific Tea Co., of Jersey City, N. J., which operates 323 branch stores in the United States, and employ some 1,500 horses in the handling and distribution of its supplies, has decided to adopt the gasoline motor vehicle for its delivery service, placing its first order with the Autocar Co., of Ardmore, Pa., for a number of trucks to be used at five of its prominent branches. These trucks will be used in the service of their Baltimore, Newark, Washington, Passaic and Jersey City branches.

Denver Likes Taxicabs—Although the five taxicabs put on the streets of Denver for the first time on January 1, already their popularity has effected the old-time cab driver, especially those on the night run. In order to meet this competition, the cab drivers have called a meeting to consider the matter of reducing rates. There is also a movement on foot among some of these drivers to take a course of study of the motor car, so as to be able to drive a taxicab. That their number is likely to be increased there is no doubt. John M. Kuykendall, president of the Denver Omnibus and Cab Co., which runs practically all the horse cabs in Denver, is in Europe now studying the taxicab question thoroughly.

Niagara Falls in Market—Colonel David Isaacs, one of the fire commissioners of Niagara Falls, N. Y., is agitating the purchase of motor trucks and engines to be used in that city. He favors an outfit similar to those used in Berlin and other European cities. For fire purposes he already has provided himself with a motor car equipped with a gong, chemical fire extinguishers, rubber coats and boots, and always turns out.

Orders Electric Ambulance—An order for an electric ambulance has been placed with the Waverley Co. by the Indianapolis board of health and charities and it is to be delivered within 60 days. The ambulance will be equipped with a forty-two-cell, thirteen-plate battery, such as is used on the heaviest trucks. It will be 8 feet long and 3½ feet wide, with side entrances. The interior will be equipped with electric heaters and lights and two folding stretchers will be suspended from the ceiling.

Hoosiers After Ambulance—Bids are being asked by Dr. Eugene Buehler, secretary of the Indianapolis board of public health and charities for a motor ambulance. The vehicle will be used at the city dispensary, displacing a horse-drawn service that has been in use about 20 years. It has been found that the horse-drawn ambulance cannot cover ground fast enough to look after the numerous calls for its services. Bids have been submitted so far by the Coppock Motor Car Co., Decatur; the Indianapolis Motor Car Co., representing the Rapid; the Studebaker Brothers Mfg. Co., South Bend, and the Hearsey-Willis Co., representing the White. No date has been set for closing bids.

Trying Motor Delivery—The Cadillac Automobile Co. of Indiana, at Indianapolis, has sold a Cadillac delivery wagon to the Marott Department Store Co., of that city. The department store was recently opened and expects to experiment with motor delivery before placing an order for several more vehicles of similar type.

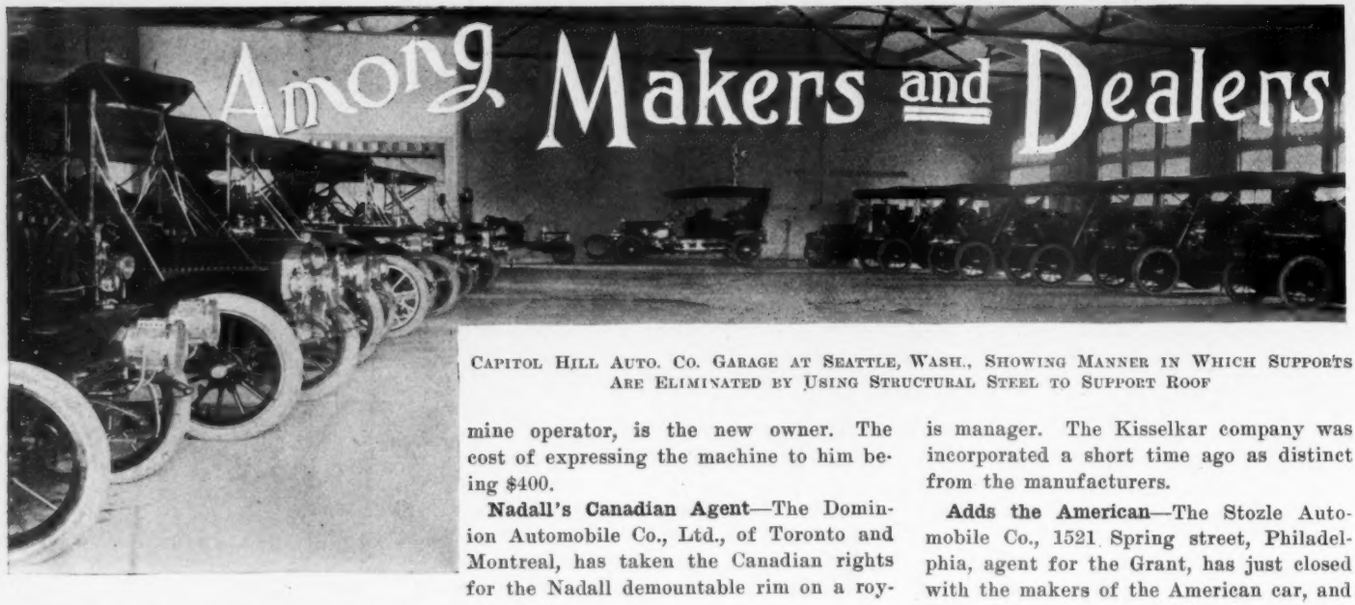
Indianapolis in Market—The Indianapolis police department will be in the market for a gasoline touring car within a short time, which is to be used for emergency purposes in making quick runs to the scene of murders, fires, burglaries, etc., and in the pursuit of criminals. The steam touring car which has been in use for about 18 months will be turned over to the board of public works. The new car will be purchased through the board of public works and will cost from $2,500 to $3,000. It will be purchased after bids have been submitted.

Duluth Orders Patrol—As a result of recent competition the city of Duluth has placed an order with the Four Traction Auto Co., of Mankato, Minn., for a police patrol. The patrol will weigh 3,500 pounds and is rated at 30 horsepower. The trade name of this new proposition is the Kato Four Drive. Several additions to the factory are planned.

Baltimore in Line—Specifications for two steam motor cars and two motor ambulances for the Baltimore fire department have been approved by the board of awards. The two cars will be for Chief Horton and his deputy, who will be appointed this month. One of the ambulances will be used to convey to the hospitals men injured on the fire grounds, while the other will be for the purpose of removing the sick or injured horses to the department's hospital. It is understood that the specifications call for White steamers. The board of police commissioners also has ordered a new 60-horsepower Locomobile patrol for the central district. It will seat twelve persons. It is proposed to build a new garage in the rear of the central police station as quarters for this car.

One More in Cleveland—Comes now another taxicab concern in the field at Cleveland, O. First the Charles B. Shanks Co. started the ball rolling, followed by the Cleveland branch of the Studebaker. Now the Citizens' Taxicab Co., headed by Francis J. Wallace, formerly of New York, enters the field, using Elmore and Cleveland Autocab cars. Thirty machines have been ordered to meet the requirements of the first few months. So far the few cabs in service have been utterly inadequate to supply the demand, and the future now appears bright for taxis in Cleveland. The new company has signed contracts with the leading hotels, grill rooms and cafes, and will also look after the depot trade.

New York Service Planned—Promoters are considering a plan to establish a motor bus service between Albany, N. Y., and Thompson's Lake and are confident of success. Each bus would carry twelve passengers and 3 tons of freight. Other buses with a passenger capacity of twenty will alternate with the combination cars. A regular schedule and fares between the towns and villages along the route are proposed by the motor line promoters.



CAPITOL HILL AUTO. CO. GARAGE AT SEATTLE, WASH., SHOWING MANNER IN WHICH SUPPORTS ARE ELIMINATED BY USING STRUCTURAL STEEL TO SUPPORT ROOF

Takes Pope-Hartford Line—The West-Stillman Co., 612 North Broad street, has been awarded the Pope-Hartford agency for Philadelphia and vicinity.

Souvenir Paper Weight—The Electric Storage Battery Co. is distributing an attractive glass paper weight advertising its Exide battery for electric vehicles and for ignition. One of these will be forwarded upon request to any of the sales offices of the company.

York Pullman in West—Herbert R. Averill, sales manager of the York Motor Car Co., of York, Pa., is in Chicago, stopping at the Annex, for the purpose of placing his car in the Windy City. He has appointed the Wisconsin Automobile Exchange the Acme agent in Milwaukee.

Winton in Baltimore—The Baltimore branch of the Winton Motor Carriage Co. will be on Liberty street, a few doors above Lexington street. The new quarters are in the heart of the city's business section and are larger and more up to date than the present location, North avenue and St. Paul street.

Welding Company Moves—The Chicago Welding Co., of which J. B. Burdett is president, has moved its factory from 55 West Jackson street to 34-36 West Quincy street, where it will occupy the main floor. The concern is the representative of the Davis-Bournonville Co., of New York, in that it handles in the western territory the latter company's process of autogeneous welding.

Big Express Charge—Express charges amounting to a fair payment on an average machine were paid last week by the Gramm-Logan Co., of Bowling Green, on a car shipped by express to the mining districts of Arizona. The machine was made with a powerful engine and unusually high axles to permit the passage beneath it of large bowlders, and was especially designed and constructed for mountain-climbing purposes. J. A. Nieset, a wealthy mine operator, is the new owner. The cost of expressing the machine to him being $400.

Nadall's Canadian Agent—The Dominion Automobile Co., Ltd., of Toronto and Montreal, has taken the Canadian rights for the Nadall demountable rim on a royalty basis.

Moline Car for Farmers—The Moline Automobile Co., of East Moline, Ill., has designed a car for the use of the farmer. The new model M has a road clearance of 14 inches when equipped with a double side chain drive and in addition has a detachable tonneau. When the rear seats are detached the car may be used for delivery purposes.

Buick Quarters Enlarged—Branch representation has proven so successful that the Buick company has not only been compelled to enlarge its present capacious quarters in Philadelphia by extending them in the rear to Watts street, but to acquire three houses on the opposite side of that thoroughfare, which are being altered for garage purposes.

Will Invade Superior—The Interstate Auto Co., which recently opened a branch at Duluth, Minn., plans to enter Superior, Wis., the twin city of Duluth, in the spring. E. B. Farnum will handle the Superior end. J. Gannon is manager of the Duluth branch. The company will specialize in Kisselkars, besides doing repairing, storage and accessory business.

Two Overland Branches—A distributing branch for the Overland has been opened in Dallas, Tex., operated under the name of the Overland Automobile Sales Co., in charge of Mr. Funk, of the Oklahoma Motor Car Co., Oklahoma City, Okla. A direct factory branch is also being operated at 1413 Michigan avenue, Chicago, under the management of Charles W. Price, assisted by F. E. Wilson.

Kisselkar Move—The Wisconsin sales agency for the Kisselkar has been established in the Abresch building, Fourth and Poplar streets, Milwaukee. The Kisselkar company will occupy the entire ground floor and part of the second floor and basement of the big vehicle works. Frank J. Edwards, formerly sales manager for the Western Malleable and Grey Iron Co. and the Miller Saw Trimmer Co., is manager. The Kisselkar company was incorporated a short time ago as distinct from the manufacturers.

Adds the American—The Stozle Automobile Co., 1521 Spring street, Philadelphia, agent for the Grant, has just closed with the makers of the American car, and will represent that machine in Philadelphia and contiguous territory.

Odd Mix-Up—On page 44 of the advertisements in last week's Motor Age, owing to a peculiarity in the setting of the type, the name Standard Automobile Supply Co. resembled Automobile Supply Co., with the result that the latter concern is in receipt of many inquiries in response to the advertisement. The proper name of the concern is the Standard Automobile Supply Co., of Chicago.

Not Kokomo Appersons—Elmer and Edgar Apperson, of Kokomo, Ind., who have been manufacturing motor cars for over 10 years, and are now conducting their business under the name of the Apperson Brothers Automobile Co., are not in any way connected with or interested in the purchase of the Toledo factory of the Pope Motor Car Co., which is under option to Richard Apperson, of Lynchburg, Va.

New Toledo Partnership—A partnership was last week formed in Toledo by A. B. Uhl and R. A. Parker, who will take over the business formerly conducted by A. B. Uhl, on Ontario street. The new partnership will be known as the Standard garage, occupying the location for a long time used by the Wood garage. The new firm has closed agencies for the Brush, Ford and Jewel. In addition a general garage and repair business will be conducted.

Breaks Away From Row—Quaker City motor car tradesmen are watching with interest the radical innovation of establishing first-class motor car salesrooms elsewhere than within the sacred confines of the row. The J. M. Quinby Co., of Newark, N. J., which handles the Pennsylvania car in the metropolitan territory, has just made the break, and is putting the large store at the southwest corner of Twelfth and Walnut streets in shape for displaying a full line of the Bryn Mawr-made cars. Manager Thornton, formerly of the firm of Thornton & Fuller, which

represented the Simplex, Panhard and Isotta Fraschini cars in Philadelphia a year or so ago, has been placed in charge.

Takes the Lozier Line—The agency for the Lozier line of cars for Los Angeles has been secured by Nash & Fenimore. This concern has been operating one of the largest garages on the coast in connection with a machine shop and repair department.

From Bicycles to Motors—W. R. Chesley, for many years one of the leading bicycle salesmen of western New York, has entered the motor car business as salesman for the Ralph E. Brown Motor Car Co., of Buffalo, handling the Winton and Rauch & Lang electrics.

Oshkosh Lands a Plant—The Commercial Club of Oshkosh, Wis., announces that it will be ready to announce within a few days the name of a big motor car manufacturing concern that is negotiating for a factory in the Sawdust City of Wisconsin. Representatives of the company are inspecting sites and looking after other facilities. It cannot be learned where the company is located at present.

New One at Fort Wayne—A sales agency and garage will be established at Fort Wayne, Ind., under the name of the Fort Wayne Automobile Co., which has just been organized by Indianapolis motor car people with $10,000 capital stock. The company will handle the Ford and Premier. Cecil E. Gibson, general manager and treasurer of the Gibson Auto Co., Indianapolis, is interested in the new company as is Chester W. Warren and Newell H. Motsinger.

Krausz Resigns—Sigmund Krausz, manager of the foreign department of the Dayton Motor Car Co., Dayton, O., has resigned his position with the concern, his contract to establish agencies for them in South America, Cuba and Mexico having been completed. On the occasion of his departure from Dayton he was tendered a farewell banquet at the Dayton Club by the Dayton Motor Car Co., in which all department chiefs participated, C. G. Stoddard presiding.

Pope Company Organization—The Pope Mfg. Co., of Hartford, Conn., has filed an organization certificate in the office of the secretary of state. Its capital stock as authorized is $6,500,000, of which $2,500,000 is prefered and $4,000,000 is common. The amount paid in cash is $3,000 and in property other than cash $6,497,000. Harry Bronner, Frederick H. Ecker and August Heckscher, of New York, hold seven shares of the common stock each, and the following hold one share each of the common stock: Milton Ferguson, Albert Stickney and Henry V. Poor, of New York; Albert L. Pope, Colonel George Pope, Charles E. Walker and Wilbur C. Walker, of Hartford; Arthur W. Pope, of Boston, and Lewis H. Freedman, of New York. The 39,970 other shares of the common stock are held by Harry Bronner, Frederick H. Ecker and August Heckscher, of the reorganization committee of the Pope Mfg. Co., which also holds the 25,000 shares of preferred stock.

New Jewel Agents—The Jewel Motor Car Co. has established new agencies with S. H. Peterson & Co., 1229 Michigan avenue, Chicago, and with the Standard Garage Co., Toledo, O.

Farrow Moves—Owing to the increase in business necessitating larger quarters, H. F. Farrow, who has the agency for eastern Massachusetts for the Grout, has moved from 94 to 117 Massachusetts avenue, Boston.

New Columbus Concern—The Roberts-Toledo Auto Co. with a capital stock of $10,000 were among the new incorporations recorded in Columbus, O. The incorporators of the new company are Charles Hartman, Frank L. Mulholland, L. M. Colgan, A. D. Williams and C. M. Sherman.

Making Four-Wheel Drives—The Badger Four-Wheel Drive Auto Co., incorporated recently at Clintonville, Wis., with a capital stock of $50,000, has started the manufacture of cars in the plant of the Zachow & Besserdich Co., machinists, which company is absorbed by the corporation.

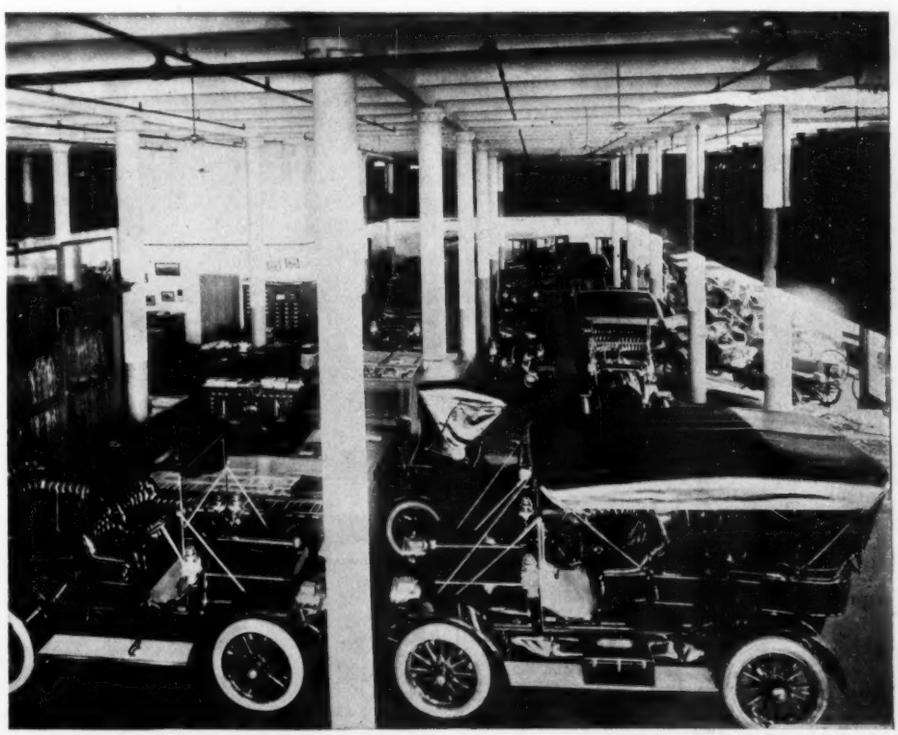
Now Central Motor Co.—The Chicago Auto Co., conducting a garage at 1333 Broadway, and which was the agent for the Locomobile, in Denver, has changed its name to the Central Motor Co., and dropped the agency for the Locomobile and taken the Midland. H. F. Longworth is president and W. H. Irion secretary, while W. C. Fawcett and A. M. Platt, the former a salesman and the latter the bookkeeper for the Colburn Automobile Co., have been placed in charge of the business.

Another Buggy Plant—Louis Splitt, of Milwaukee, has definitely decided to establish a small motor car factory at Manitowoc, Wis. Splitt is inventor of a new buggy car. Later he intends to purchase the Manitowoc Beach hotel and convert it into a factory.

Hartford Line—A taxicab line will be inaugurated in Hartford, Conn., by R. D. & C. O. Britton, Maxwell agents. Four-cylinder Maxwell chassis will be used for the purpose. At present there is nothing of this sort in service though several liverymen have done a good trade in motoring liveries.

New Firestone Branch—A new direct branch has been opened by the Firestone Tire and Rubber Co. at 957 South Main street, Los Angeles, Cal. The management is in the hands of G. C. Calbetzor, formerly Pacific coast representative, and also Frank R. Talbott, who has resigned as assistant treasurer of the Firestone company. The new branch will be the distributor of Firestone tires for southern California.

Defiance Concern Moves—The Miller Machine Co., of Defiance, O., has vacated its old quarters in the Defiance bicycle factory building, and moved into more commodious quarters. The new location was formerly a skating rink on Front street, the building having been fitted up for the purpose with cement floors, machine rooms and other requisites. This concern conducts one of the largest garages in northwestern Ohio, outside of Toledo.



INTERIOR OF SALESROOM OF THE STUDEBAKER BROTHERS CO., OF CALIFORNIA, IN SAN FRANCISCO

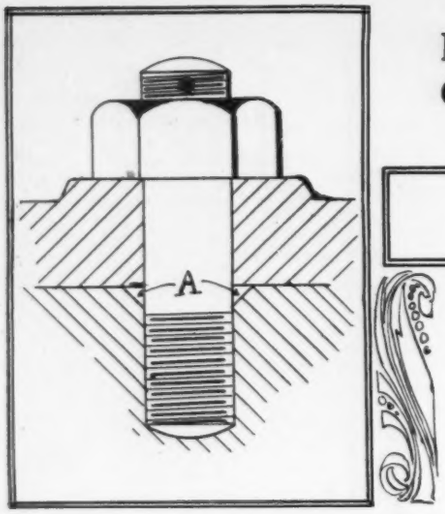


Fig. 1

How To Stop the Many Oil Leaks in Motor Cars

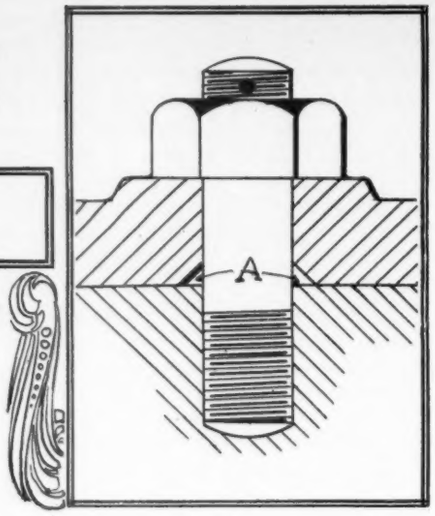


Fig. 2

IT IS NOT so very long since it was the accustomed thing for every motor car to deposit a pool of black oil at every halting point. This did no harm on country roads or macadam, but it damaged asphalt pavements and was bad for the pocket of the owner. Nowadays the tendency is to use improved and therefore more expensive grades of oil, and the monetary loss from leakage is consequently greater. Therefore motor car makers are making more or less determined attempts to confine the oil within its proper territory; but we have scarcely reached the ultimate stage of requiring that there shall be no dripping whatever. Nevertheless, we are discovering that dripping can be prevented, and the logic of the outcome is inevitable. In time we shall have cars practically as clean beneath as they are outside, for with leakage eliminated water is likewise excluded, and, as dirt will not cling where the surface is not oiled, it follows that all the machinery can be washed with a pressure hose. Even the planetary gear, which in some forms has a heart-breaking trick of ejecting its contained oil every few miles, can be brought within bounds by enclosing it in an oil-tight case. The points at which oil escapes may be classified as follows:

A—Joints between stationary surfaces, as in crank and gear cases, cover plates, etc.

B—The exposed ends of plain bearings using oil.

C—The same bearings, using grease.

D—Ball bearings using grease.

E—The same bearings, using oil.

F—Miscellaneous small joints and bearings oiled by squirt can.

A slight leakage of oil, which does no great harm except to gather dust, is generally expected at the joints where the crankcase and gearbox are split, and where the cylinders bolt to the crankcase. It may be prevented altogether by making up the joints with paper gaskets or with a mixture of shellac and red lead, or by hand scraping the joints to a surface plate. The last named is probably the ideal method except for its first cost; but it demands that the surfaces shall be wiped perfectly clean before they are assembled, and not every chauffeur or repair man is particular about this. However, the most troublesome part of wiping is to clean away the dirt close to fixed studs, and by using bolts in place of studs, or by countersinking slightly either the surface from which the studs project or the surface matching it, as in A, figures 1 and 2, the necessity for extreme care at this point is avoided. If the surfaces are not scraped it is better to avoid dependence on paper gaskets when the split is in the plane of a shaft, as they are troublesome to replace, and if a gasket of different thickness is substituted it may cause the crank or gearcase to bind or be loose on the bushings. Shellac, or shellac mixed with red lead, is equally effective, and much simpler. Gaskets can scarcely be avoided in connection with bottom hand holes, but bushings are not here involved, and cotton wicking or asbestos serves very well. Top hand holes are above the oil level and do not require such careful attention, though they may be scraped to a surface if one is very particular. Incidentally, why is it that so few manufacturers make these cover plates with handles by which they may easily be lifted against the suction of the oil tending to hold them down?

Probably more oil is wasted from the front and rear crankshaft bearings than at any other point; but it is unnecessary to lose a drop except by capillary creeping. The front bearing is usually provided with some device for throwing off oil or preventing it from leaking along the shaft; but dust usually has a chance to enter here and the front bearing must be made longer than would otherwise be necessary to offset the probable cutting from dust. If the two-to-one gears are enclosed it is possible to carry a sleeve from the gear housing or from the bushing itself right over the shaft of the starting cranks, thus at once preventing escape of oil and entrance of dirt. There are various ways of doing this, depending on whether the two-to-one pinion is inside or outside the front bearing, and on the arrangement of the front housing and the front cross member of the frame. One possible arrangement is clearly illustrated in figure 3.

With all plain bearings, whether lubricated by oil or by grease, it is necessary to remember that the lubricant requires a free outlet at both ends of the bearings. If the device for preventing oil leakage takes the form of a stuffing box placed directly at the end of the bushing, the oil will be unable to escape from that end, and will therefore accumulate grit from the metal surfaces themselves, to the early destruction of the bearing. If the engine is one of the once common type having the crankcase supported from the bottom in-

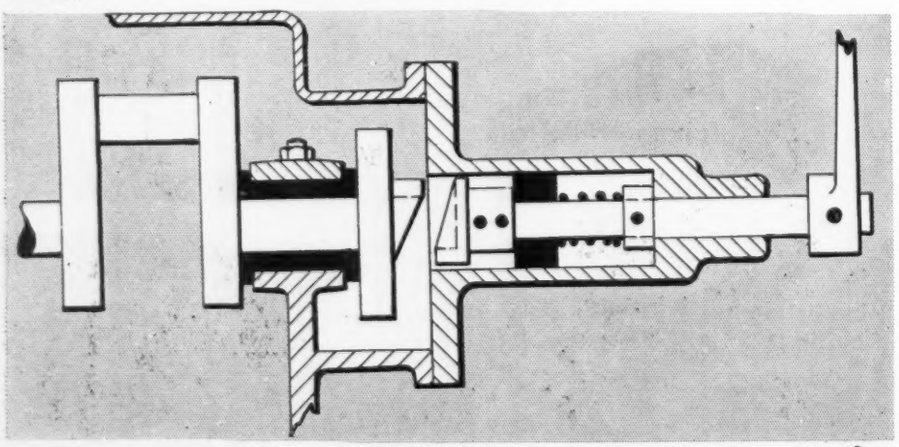


Fig. 3

stead of from the top half, it is quite possible that the end bearings have substantially the form shown in figure 4, and contain no provision for the return to the crankcase of the oil escaping from the outer end. Such a bearing may be treated about as in figure 5. A circular internal groove A is cut near the outer end of the bearing, and from this groove a hole B is drilled, communicating with the oil well C or with the interior of the crankcase, so that the oil entering the integral groove may flow back of its own accord. Quite possibly this will be all the provision requires, but if it proves insufficient, and there is room to insert a felt washer between the end of the bearing and the flywheel flange D, or whatever occupies the exposed end of the shaft, such a washer will complete the job of oil retention.

Two examples of more modern engines are shown in figures 6 and 7. The engine is supported from the upper half of the crankcase, and oil escaping from the outer end of the bearing simply drips into the extension of the oil pan beneath. These last two mentioned are not wholly oil tight, but that shown in figure 6 is sufficiently so for practical purposes. If desired, a final closure preventing the oil from leaking out and dirt from entering may be made by facing the outer end of the crankcase and interposing a felt ring between it and a flange or special washer on the shaft. A solid felt washer is not necessary, as a simple ring with a wire clip sprung around it will answer just as well. This arrangement permits the shaft to wear down in its bearings without affecting its oil and dustproof features. Figure 8 at A shows this improvement applied to the engine illustrated in figure 7.

If the two-to-one gears are exposed, oil can escape from at least one end of the camshaft bearings; and if the camshaft is only partially housed there are other chances for oil to escape. The leakage at these points may not be considered a serious matter, but if desired it can be prevented by the use of a felt ring. Camshafts which run in ballbearings, and pump and magneto driveshafts similarly mounted, may be treated as indicated in a later paragraph.

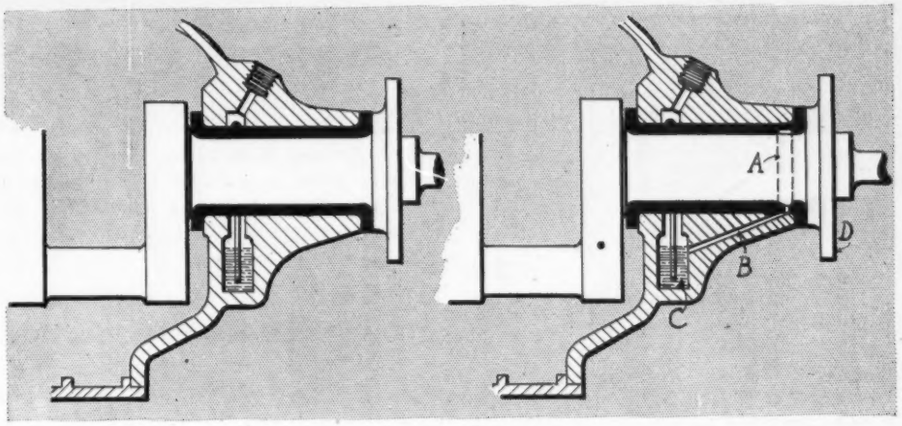


FIG. 4 FIG. 5

Gearshaft bearings are made dustproof by simple cover plates when the shafts do not extend through. If the bearings are plain, the only precaution necessary is to provide a return groove for oil escaping from the outer end of the bearing as shown in figure 9. In case the shaft projects beyond the bearings it must be treated as indicated above in connection with the crankshaft bearings, an oil return groove and felt washer being provided. Plain bearings, however, are disappearing from gearboxes, and are seldom found today. Where ball bearings are employed the proper closure is generally specified by the makers of these bearings. A common closure recommended by one of the principal American makers of ball bearings for a stationary housing and revolving shaft, is shown in figure 10. It will be seen that, because these bearings do not wear down, they may be treated much more rigidly than plain bearings. The simplest arrangement, yet quite sufficient if the bearing is packed with grease or vaseline, is a pair of bored shoulders A forming part of the casing and having between them a recess not less than $\frac{3}{16}$-inch wide and $\frac{5}{16}$-inch deep. The lips of the shoulders must be sharp, and their diameter should be not over .02 inch larger in diameter than the shaft. The outer shoulder has a hole drilled through at its lowest point to drain the recess of water. If the ball bearing is lubricated by oil, it is best to have a third shoulder inside, drilled through inwardly to drain oil that gets past it and would give trouble.

Another feasible arrangement is simply to use the felt ring, in either of the ways A or B shown in figure 11. This, however, is less effective to prevent oil from getting out than it is to prevent dust from getting in, which latter purpose it fulfills perfectly. In case, however, the bearings are so enclosed at their inner ends, figure 10, that they may be packed with vaseline, thus practically preventing the oil in the gearcase from getting past them, this arrangement is all that is needed. In passing it may be remarked that it is exceedingly well on general principles to house all the bearings of a gearcase in this manner, since only thus can they be efficiently protected from the steel grit worn from the gear teeth.

While on the subject of gear cases, it may be noted that a respectable amount of oil may escape around the sliding shifter rod. If this rod is placed beneath the level of the oil, even a stuffing box will not long prevent leaking, as the dust will cut it. If possible the rod should work in the upper portion of the gearbox, where a fairly long sleeve with a stuffing box at the end will keep it reasonably clean. A refinement, which would undoubtedly prevent almost all escape of oil, would be to turn a circular groove A in the sleeve near its outer end, as shown in figure 12, and to cut a continuous groove B lengthwise from the circular

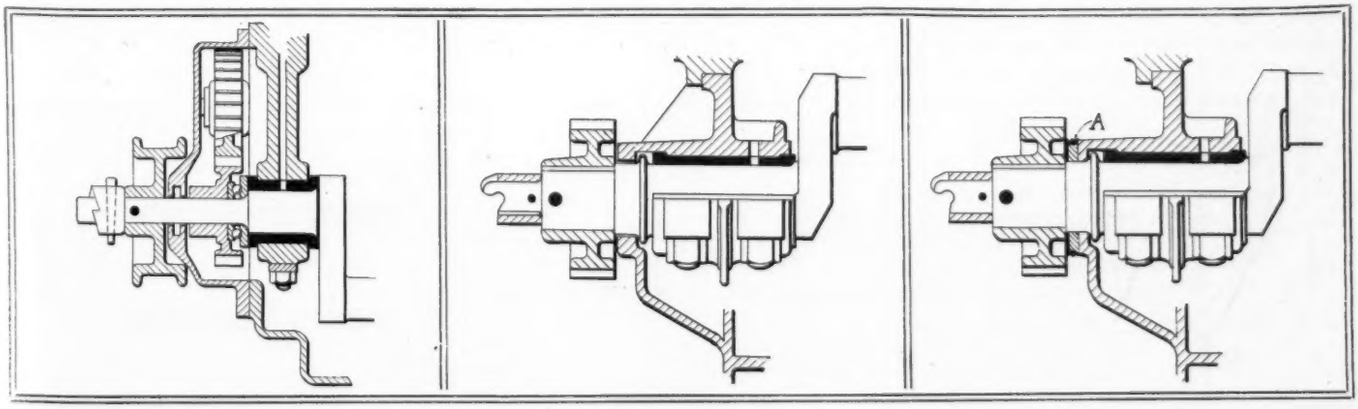


FIG. 6 FIG. 7 FIG. 8

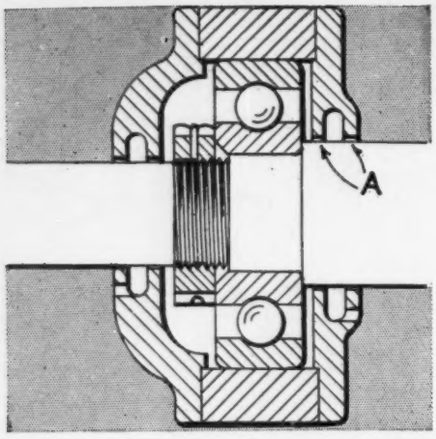


FIG. 10

groove leading back into the gearbox. This would cause the stuffing box to force the surplus oil clinging to the rod back into the groove, which would call for only a slight pressure and a moderately tight stuffing.

A ball-bearing hub may be protected at its inner end from ingress of water, when the car is washed down, either by the double shoulders shown in figure 10 or by a suitably disposed felt washer. The precise arrangement will depend on the details of construction; but it is well to use a washer of wide radial surface subjected to moderate pressure, as it will wear longer than one of narrow surface under considerable pressure.

Rear axles other than those of the floating type are apt to throw oil from their ends adjacent to the wheels when the casing containing the bevel gears and differential is filled too full; and the oil thus escaping is likely to enter the brake drums and temporarily destroy the holding power of the brakes. Since this is an accidental occurrence it hardly calls for special treatment; the remedy is to learn to use less oil. However, it is possible to drill small drainage holes in the bottom of the axle sleeve to discharge the oil before it reaches the brake drums.

The rapidity with which unprotected propellershaft joints wear has led to much activity in producing dustproof joints, and today the owner has little to do in this regard except possibly to be careful that, in his zeal against dripping oil, he does not use grease so stiff that it will not flow. As the movement of the parts of a universal joint is oscillating instead of rotating, there is very little inducement to the lubricant to enter between the surfaces under pressure. Oil will enter a capillary attraction, but grease, unless it is made fluid by the heating of the bearing parts, will stay out because there is no motion or pressure to work it in. Since some viscosity is desirable owing to the high pressures, a thin mixture of oil and grease, with a little graphite added, should be suitable for most cases.

What Causes Pre-ignition

If the inside surfaces of the combustion chamber are free from sharp corners or projections formed in casting pre-ignition is probably due to the combined influences of high compression and carbon or dirt on the piston head. Next to the exhaust valve itself the piston head is the hottest part of the engine, since it cannot be water cooled. For this reason it is much more important to keep the piston head clean than the other surfaces exposed to flame, and this is best accomplished, first, by the use of a good non-carbonizing oil, and, second, by thoroughly screening the air intake. If pre-ignition is troublesome it will pay to fit a dust screen underneath the engine in case none is already provided, since whatever dust touches the piston head will be held there by the oil and will be fully as effective in causing pre-ignition as the same amount of carbon. The intake itself should draw air through at least one and preferably two or more fine wire gauze screens of sufficiently large area to permit the air to pass through them slowly. These screens should be removable and should be inspected and cleaned with gasoline and a toothbrush as often as may be necessary. It will be found that the fitting of a suitable dust screen beneath will make an immense difference in the amount of cleaning which the gauze screens require. In the manufacture of high classed motor cars the greatest care is taken in scraping the walls and dome of the cylinder castings forming the combustion space, the aim being to remove every projection that might cause a pre-ignition point as also to remove every burr or rough spot to which foreign matter would adhere. The lubrication system of a car is a most important factor in the elimination of preignition due to the proper amount of oil being fed to the cylinders at all times.

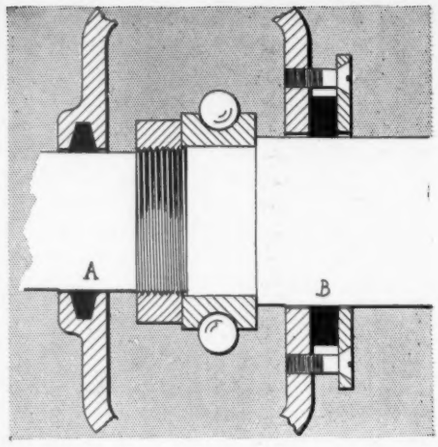


FIG. 11

If the housing of a steering gear is closed in by a bottom cap, and is packed with semi-fluid grease, it ought to run a season without attention and without leaking. Steering knuckle pivots are doubtless best oiled every day from a squirt can, but the joints at the end of the links should be packed in very thin grease and enclosed in leather boots. Ordinary grease is utterly useless, and a squirt can is not much better.

As for the multitudinous small bearings about the car, the best that can be done is to put dust caps on them wherever possible, and wipe them clean after each oiling. They require only a little oil, and if they are oiled once or twice a week it is usually ample. The main thing is to keep them free from dust, since the dust draws away the oil by absorption and leaves the bearings dry. It is only the force of custom that has made us associate roadside work on motor cars with hopelessly grimy hands and smeared faces. The car of the future will be a clean car inside as well as outside, and with a duster and a pair of gloves no owner will be afraid to drive it, even to most sorts of social affairs. The excessive secretion of oil from bearings on cars has led in one or two foreign countries to regulations calling for excessively complex and carefully made underpans, which regulations seem to be poor in view of the nature of the trouble. The proper solution is the prevention of grease and oil leaking from bearings, which can be accomplished by good construction.

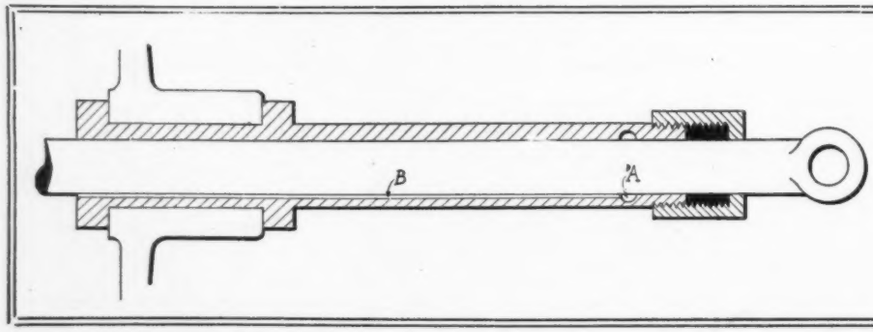


FIG. 12

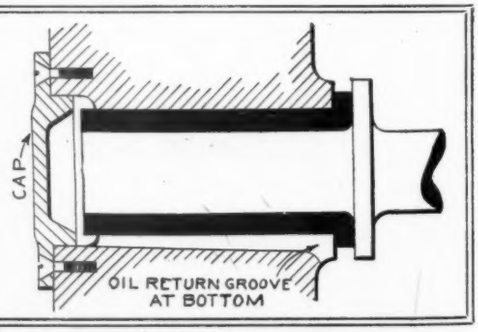


FIG. 9